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Journal of the Society of Arts.

FRIDAY, APRIL 20, 1866.

Announcements by the Council.

Ordinary Meetings.

Wednesday Evenings, at Eight o'Clock:—

April 25.—"On the Perils of Mining, and the Means of Preventing them." By Jabez Hogg, Esq.

May 2.—"On National Standards for Gas Measurement and Gas Meters." By George Glover, Esq.

Cantor Lectures.

A course of four lectures "On the Synthesis and Production of Organic Substances by Artificial Means, and the Applications which some of them receive in Manufactures," is now being delivered by Dr. F. Crace Calvert, F.R.S., as follows:—

Lecture II.—Friday, April 20th.

"On the Transformation of Neutral Substances."

On the transformation of *starch* into *cane* and *grape sugars*, and also *pectic acid* (with remarks on the ripening of fruits and the production of jellies). On the transformation of *sugar* into *alcohol*, *ether*, *aldehyde*, *acetic*, *formic*, *prussic*, *oxalic*, and *butyric acids* (the acid of rancid butter), and also the conversion of *sugar* into *mannite* (obtained also from manna), and into *lactic acid* (acid existing in the blood and flesh of animals, and also in sour milk).

Lecture III.—Friday, April 27th.

"On the Transformation of Organic Acids and Animal Substances."

The artificial production of *benzoic acid* (found in benzoin resin) from the essence of *bitter almonds* and from *coal tar* products, and its conversion into *hippuric acid* (found in the secretion of herbivorous animals); of *tartaric acid* (the acid characterising cream of tartar), from *sugar of milk* and from *succinic acia* (the acid obtainable from amber), and its decomposition into *oxalic* and *acetic* acids—On the transformation of *citric acid* (the acid of lemons and oranges) into *aconitic acid* (found in wolfsbane)—On the transformation of *malic acid* (which characterises the acid flavour of green gooseberries, apples, and rhubarb) into *fumaric acid* (the acid of common fumitory) and also into *equisetic acid* (the acid found in the marsh horsetail), and, lastly, into *asparagine* (the body found in asparagus and potatoes)—On the transformation of *uric*, *cyanuric*, and *cyanic* acids into *allantoin* (the substance found in the allantoid fluid of cows)—On the artificial production of *urea* (a substance which characterises the liquid secretions of man and of many other animals).

Lecture IV.—Friday, May 4th.

"On the Artificial Production of Aromatic Substances."

On the transformation of *salicine* (the bitter principle of the willow and poplar) into the essential oil of *meadow-sweet*, *coumarin*, and of the *tonquin-bean*—On *salicilic acid* and the artificial production of the fragrant essential oil of the *wintergreen*, or *gaultheria*—On the transformation of *indigo*, the *oil of potatoes*, and that of *camomile* into *valerianic acid* (the acid which characterises the odour of valerian-root; the berries of the common guelder-rose; the oil of the fish porpoise, and of certain kinds of cheese)—On the conversion of *essence of turpentine* into *camphor*; of the essential oil of *mustard* into that of *garlic*, &c., &c., &c.

The lectures will commence at eight o'clock, and are open to members, each of whom has the privilege of introducing one friend to each lecture.

The substance of these lectures will appear in the *Journal* during the autumn.

Proceedings of the Society.

Musical Education Committee.

The Committee met on Wednesday afternoon, February 7th. Present—Henry Cole, Esq., C.B., in the chair, Sir John E. Harington, Bart., Rt. Hon. Sir Geo. Clark, Bart., Edgar Bowring, Esq., C.B., Lieut.-Col. Scott, R.E., Capt. Donnelly, R.E., and R. F. Puttick, Esq.

Mr. John Hullah examined by the committee.

858. You were a pupil of the Royal Academy of Music?—I was in the Academy for a short time.

859. At what period?—Nearly thirty years ago; I was a student of singing only.

860. Who was the principal of the Academy then?—M. Cipriani Potter.

861. Are you familiar with the present state of the working of the Academy?—Not at all; I have not visited it for a long time past.

862. You have no wish to give evidence to the committee upon the existing state of the Academy?—I know nothing, save by hearsay, of the existing state of the Academy. I consider that the Academy has been useful to the country in past times, and may be useful still. The inevitable occupation of the majority of English musicians is teaching—principally teaching one instrument—the pianoforte—and the Academy has improved the quality of English pianoforte teaching, and educated a large number of teachers. These, for the most part, lead quiet and unnoted, but very useful lives. I think that a good deal too much is expected of academies. They cannot create genius. Considerable periods must intervene in the history of every art during which very little original faculty, whether creative or executive, presents itself; for even the supply of first-rate executive skill seems attended with uncertainty. The Paris Conservatoire, for instance, with its large subvention and admirable staff, is far from being successful in every department. It by no means keeps the Académie Royale supplied with first-rate singers. Who can be said at the present time to fill the the places of Falcon, Nourrit, or Levasseur? It is so also in the dramatic school. The only successful *tragedienne* of late years has been an Italian, Madame Ristori. The best actors now at the Théâtre Français were celebrated thirty years ago. Who have succeeded Mars or Rachel? Who are the rising artists likely to succeed Plessis and Regnier?

862. Are the committee to conclude from those opinions that you think an Academy of Music is unnecessary?—Certainly not: by no means. The Royal Academy was never "unnecessary," and might have been most useful; but it has suffered grievously, ever since its origin, from want of funds, from impecuniosity and the depressing influence of a continual struggle for existence. I have been looking lately into Mr. Cazalet's "History of the Royal Academy of Music." It is one long story of pecuniary difficulties.

I find that within two years of its foundation it was only saved from destruction by a wide departure from its original plan, and by the very objectionable resource of prevailing on the professors to teach during a certain period gratuitously. A year or two after this I find that the Academy was saved from destruction by the admission of a mob of students, whose sole qualification seems to have been the ability to pay for their instruction. After this, public concerts were established, which were "successful" (*i.e.*, they paid their expenses) for one year; but in the next year, the scheme proving unproductive, the Academy was again on the point of being closed. This again was averted by a loan without interest—no mention of the repayment of which is recorded. After this the institution struggled on for a few years longer. Then came the Westminster Abbey Festival, in 1834, which helped it a little. After that the friends of the Academy took to dancing for its benefit, and it was kept alive for some time by a succession of balls; and so on to the end of the chapter. It seems to me that the great desideratum of an academy of arts is the power of selecting—which involves also rejecting—its pupils. In places of general education something must be done, and can be done, even for the dullest; not so in a place for special training. The art and the individual are equally wronged, I think, by retaining in a school of music persons who, it is certain, will never learn to write, play, or sing decently.

863. You think if the Academy provided by some means for the tuition of real musical ability it is not expedient that it should admit other pupils, merely on the payment of the fees, who may not seek to be professors or performers?—No; I am not quite of that opinion; but I think there should be some general principle of selection, and that persons whose incompetency was ascertained, however much they were disposed to pay, should not be allowed to continue students. The difficulty, however, with which a poor academy has to deal, is not so much in being obliged to admit the incompetent as in being obliged to reject the competent. It must often not only receive unpromising students who can afford to pay, but, what is worse, exclude promising students who cannot.

864. Assuming an arrangement could be devised by which persons of eminent ability could be taught gratuitously, and supported while being taught, and persons of less ability could be admitted, either without fees or at nominal fees, and that another class could be admitted at very low fees—assuming all these gradations to be established, should you still object to the public coming in and paying a very high fee, such as would be amply remunerative, and even contribute considerably towards the expenses of the institution?—No; I should not. I contemplate several classes of pupils.

865. Amateurs?—Yes. It would be impossible to shut them out, even were it desirable to do so. The history of Queen's College will prove that. It was instituted with the express view of assisting and facilitating the education of a class—governesses. But a practical difficulty arose at once—how to distinguish between governesses and others. It was found that such a distinction could not be made, and everybody who applied for admission had to be admitted.

866. It has been stated in evidence before the committee, that on one occasion a lady took her two daughters to the Academy to enter them as students, and on its appearing that they had no musical ability, either in their fingers or voice, she was asked why she brought them to the Academy, when her reply was, that her doctor had recommended her to do so. You, of course, would exclude manifest incompetency and inability; but you would not microscopically investigate the reasons why a person entered, or probe very much their ability, provided they paid a very adequate and competent fee?—No; I should not.

867. But, whilst admitting the public, you would take care they did not impede the real business of the institution?—Certainly. I think, especially at first, there might be a great rush of idle people in search of a sensation—people who did not care to learn anything, but who wanted amusement.

868. You would make them pay highly?—Yes; but I do not think any payment would compensate for the nuisance caused by their presence.

869. That would be a matter of control or direction?—Of course the directors would have power to refuse admission to any one, or to suggest to a pupil that he had better not come any more.

870. In the view you intimate it is obvious there must be a fund, more or less in the nature of an endowment, to enable the institution to be all that it should be?—Certainly. Few places of education have been permanently self-supporting.

871. Including Oxford and Cambridge, Eton and Harrow?—Yes. Endowment is to an institution what the fly-wheel is to machinery—it prevents its moving by jerks. I have in mind at this moment a public school of which the numbers rose at one period to an enormous amount. It suddenly went out of fashion, and it must have been closed but for its endowments. I do not believe this is an exceptional case.

872. By endowment you do not imply payment without results?—Educational results are difficult to ascertain, but I think in music they are to be ascertained, approximately at least.

873. Is it your opinion that it would be a more feasible policy to attempt to improve the existing Academy than to attempt to create a new institution?—I think the present Royal Academy should, if possible, be saved from extinction. I do not know how far this is possible, but I should be sorry to believe it otherwise, and unwilling to give it up without an effort. It is more conformable to English feeling and habit to reform, repair, and restore old institutions than to call into existence new ones. If, as a preliminary to the birth of a new Academy, the *coup de grace* were to be given to the old one, I think the long sickness and death of the latter would be a powerful and popular argument against the endowment of the former. One Academy, it would be said, has been tried for forty years, and has come to a bad end. The thing is an exotic, and will not flourish here. The English are not a musical people, &c. Of course all this can be answered, but, a cry once got up, answers to it are little heeded. The existing Academy has been compared, I find in former evidence before this committee, to an old coat. Now, if an institution with any life in it can with propriety be compared to any kind of old coat, it must be to one of those old coats referred to in Swift's "Tale of a Tub"—coats which adapted themselves to every size and variety of figure, and, being kept nicely brushed and occasionally repaired, lasted for ever. In this sense the British Constitution is an old, a very old coat, which, in our own time, has out-lasted half-a-dozen bran-new garments which a neighbouring nation has put on and off in succession. The existing Royal Academy has one enormous advantage over any proposed institution—the simple one that it exists. It is ill, very ill indeed—moribund, perhaps, but not dead yet; and "while there's life there's hope." It has a name—the Royal Academy of Music—for which it would be difficult to find a substitute, and which could not at present be appropriated by a new institution. It has a charter, and I suppose it has some funds. It has—at all events it has had—some reputation. There are, no doubt, practical difficulties in the way of grafting new ideas on an old conception, and virtually reforming the existing institution, but I cannot conceive that these difficulties are insurmountable.

874. You do not see any practical difficulty or impossibility, in the Royal Academy of this country being as efficient as the conservatoires of other countries, do you?—No difficulty of any kind.

875. You do not sympathise in the opinion that the English, as a nation, are not a musical people?—No; but I think there is this difference between England and other countries—that the greatest aptitude and the finest taste, in foreign countries, are found among the aristocracy, and that precisely the reverse is the case in England. I say this after a very long continued observation. We go, for instance, to a national school to commence a singing class, and out of 100, or even 200 children, boys and girls, there perhaps will not be one who cannot, the first time of trying, sing the scale fairly in tune. We go to a public school like Eton or Harrow, and out of every half-dozen boys, one or two will make the most hideous noises that can be conceived. I make every allowance for temper and unwillingness to learn; but the difficulties of teaching music in schools of the higher classes are enormously greater than in those of the lower.

875a. Have you found the same in the Wellington College?—I know nothing of Wellington College personally. It is better than it was, everywhere; the national ear has improved. Still, at present, the number of persons who have no aptitude for music is very great among the higher classes.

876. Would you apply this remark equally to the female portion of the higher classes?—Undoubtedly: certainly.

876a. Although there is no lack of desire on their part to engage the most competent musical talent in the world to try and teach them?—Not at all.

877. Do you consider this arises from any physical inability?—No; but from the physical powers called into requisition in music having been uncultivated among the higher classes in England for many generations past—since the middle of the seventeenth century.

878. You think, in a given number of children of the aristocracy and the same number of children of the lower classes, you find the largest amount of musical aptitude among the latter?—There is no comparison whatever.

878a. And that opinion applies equally to both sexes?—Yes; quite so.

879. The middle classes you except?—They share in the advantages and the disadvantages of both the other classes. Considerable difficulties would arise in the institution of an academy, from the fact that so small a proportion of the higher class takes any real interest in music. One thinks of the great officers—whether in church or state—and asks who is there amongst them that cares about music. Who among our nobility keeps, or even occasionally engages, an orchestra? Who among his friends would care to hear it if he did? Look at the list of subscribers to the Philharmonic or any similar concerts. English people of rank go to the opera. That is a social affair, which has little to do with music itself. I do not think that among the higher classes music is respected or valued very much. No Englishman hesitates to confess his ignorance of music; indeed, he generally proclaims rather than confesses his deficiencies in this matter, as though he expected to be admired for them. I am not putting this as a positive impediment, but as a difficulty.

880. And yet there are instances in which the sons of noblemen might be mentioned as examples proving your rule?—There are exceptional cases, no doubt, and they have become more numerous of late years, as they will become still more numerous in future years.

880a. You are aware that the Royal Academy of Music has at present a grant from Parliament of £500 per annum?—Yes.

881. Do you consider that adequate to the objects in view?—Certainly not.

882. You regard it as a beginning that may be beneficially enlarged?—Certainly.

883. You would be prepared, of course, if Parliament were disposed to vote the requisite funds, that such funds should he administered under proper conditions?—Certainly. I am not sanguine as to the success of an appeal to Parliament, especially as a first step. The spirit which all but "stamped out" English music in the seventeenth century is by no means without vitality in the present day. Any proposition to assist the theatres in any shape would be met by a howl of indignation. Supposing this, however, avoided, and that your scheme included only musical instruction in the abstract, it may be doubted whether the time has come for finding support for it in the House of Commons; but I think the State might contribute on conditions similar to those which regulate its connection with the training colleges for schoolmasters, which have not been established by Government grants, but assisted by them after they have been established by societies (largely aided by private munificence), the annual grants made by Government being in proportion to the annual outlay of these societies. An institution with supporters of this mixed character would probably be assisted by donations or legacies for scholarships, &c. This has been the case to a considerable extent at Queen's College, which only a few weeks since received a present of £1,000, a like sum being given by the same individual—a lady—to a similar institution.

884. Are you aware what has been stated in evidence before the Committee with regard to the parliamentary grant to the present Academy? There is a letter written by Mr. Gladstone, making it a condition of the continuance of the grant that the Academy should be able to show a satisfactory amount of public support?—I did not remember that. My own view is, I think, original, and has not been suggested by anything I have heard.

[The Chairman read the following extract from a communication from the Lords Commissioners of Her Majesty's Treasury, published in the *Journal of the Society of Arts*, Vol. 13, p. 635:—

"1. In the event of their taking any step such as has been shadowed out, they remain entirely free to consider what shall be the nature, particulars, and conditions of any aid which it may be proposed to give.

"2. In particular, they will deem it necessary to be assured, by sufficient proof, that the institution which may claim to be the immediate recipient of aid is not only one entitled to acknowledgments for past services, but is also in possession of the general confidence of the profession, and is constituted in the most effective manner, and on the most liberal principles for the prosecution of its purposes; or else is engaged in adopting such measures as may entitle it to claim to correspond with this description.

"3. They would think it necessary that measures should be adopted by the Royal Academy of Music to obtain a much more extended amount of voluntary support, so as to secure to it the character of an institution having the promise of permanence from its own resources, and seeking not to throw upon the state a task refused by private liberality, but to obtain by the countenance, as well as the funds of the state, power to prosecute its proper aims, upon a scale more fully adequate to their importance."

885. (To the witness).—Do you concur in those opinions?—Decidedly. Before, however, we quit the subject of endowment, I should like to advert to a point which has been mooted in reference to another source of income. It has been asked why an academy of music, granting that it cannot be supported by students' fees alone, cannot make up its shortcomings by concerts, as an academy of painting may do and does, by its exhibitions. Now there is no analogy between an exhibition of pictures and a concert. The exhibition of a picture, once finished, costs the painter nothing; on the contrary, it is to his advantage in every way that it should be seen. A concert that will be remunerative requires, at a particular time, the presence of a number of performers whose reputation is already made, whose time is their best property, and whose assistance can bring them nothing but loss. No doubt concerts of great interest could be given by the students only of an academy of

music, but the interest would be confined to a class that would not pay to attend them. If, however, an interest were got up in a new academy, a body of subscribers might be formed to whom concerts by the students would give pleasure—something, in fact, for their money. I am not, however, sanguine about subscriptions, which too often have to be kept up by all kinds of mean acts. Subscriptions would be useful, however, as indicative of interest in music, and would thus help to justify a government grant.

886. A suggestion was thrown out by Mr. Macfarren as to the importance and value of attaching a chapel to the Royal Academy of Music, which would be useful for the practice of church music and attractive to subscribers, (who might be disposed to take seats in the chapel) and to some extent remunerative to the Institution. That idea seems rather to accord with your own views as to concerts?—The subject is surrounded with difficulties, and I am not prepared to speak upon it.

887. Do you think it advisable generally to encourage performances in public by the pupils before their education is finished?—Yes, if it is quite understood what the performances and who the performers are—that the latter are merely pupils and not professors. That matter has been so little understood hitherto that comparisons have actually been made between the performances of the pupils in the Royal Academy and those of the members of the Société des Concerts of Paris! the one given by unfinished pupils, and the other by some of the first performers in the world, who have, in many instances, been playing together for 30 or 40 years.

888. Do the performances of the Paris Conservatoire include the whole of the students?—Certainly not; except, perhaps, as regards the choruses.

889. Are the members of the orchestra all former students?—I believe all are former students, but the *crême de la crême* of them. Taking a general survey of the Conservatoire orchestra, I should say there is not a man in it under (say) 40 years of age.

890. Are you aware if it is the habit in Paris to give concerts by the pupils alone with any publicity?—With a certain amount of publicity I believe it is done.

891. Are these concerts open to the public?—I think not,—only to certain privileged persons.

892. You would probably think it desirable that the concerts of the Academy should be heard chiefly by the subscribers, who would understand and appreciate the object for which they were given, *viz.*, to show the progress of the pupils, and not be open to the public in competition with other concerts?—Certainly. Moreover, a great incidental advantage is obtained for the students by such concerts; that through them they are practised in what is a difficult part of an artist's calling—appearance before the public. It has been my lot to bring forward a great many *débutants*. Some of them have been so incapacitated by nervousness that, but for extreme indulgence on the part of the audience, the performance in which they were engaged could not have been brought to an end. That would be avoided by appearances in semi-public performances.

893. Care being taken that the public, in ignorance of the objects, did not view the concerts as competitive with those of practised musicians?—Just so.

894. You are favourable, on the whole, to subscriptions, though you prefer to do without them if possible?—I think by subscriptions and students' fees, for a time, at any rate, a very considerable income might be raised; but I value subscription chiefly because I think it would be more easy to get a parliamentary grant as an addition to these, than to start with a parliamentary grant.

895. Do you think subscriptions would come to a new Academy readily, from an interest in music; or do you think there must be inducement held out to tempt subscriptions?—I think I would rely on the interest in the first instance, and then I would try and reward it in some way afterwards. I do not think you would have much difficulty, for a time.

896. You have already expressed a decided opinion in favour of fees?—I should wish to see them graduated. At the same time I contemplate a large number of open scholarships,—even to the extent almost of helping students in food and clothing, as I think you would have cases in which this help would be needful. At the same time my own experience of training institutions is that promising persons of the humbler classes almost invariably get assistance somehow. Somebody is always ready to come forward and do a little for them.

897. Do you think something of the same kind would be applicable to music?—Certainly.

897*a*. Have you formed any definite opinion as to the constitution of a new or improved Academy of Music?—I am not prepared with a cut and dried scheme, but I have a general view which I would bring before the committee. I think the constitution of the new Academy (however called) might approximate to that of Queen's College. There would be a patron; in this instance, I apprehend, a patroness; a visitor; a council; a body of lady visitors; a committee of education; a principal and working secretary; a lady superintendent. The council, in whom the property should reside, should have the control of the finance and of all the business details, and should be a court of final appeal in all matters of dispute or difficulty that might arise among professors, students, or others connected with the institution. The council should consist chiefly of gentlemen not members of the musical profession—I say chiefly, not exclusively. Cases would frequently come before them in the solution of which professional experience and exact knowledge of music would be most useful. I think, however, that the professional members of the council should be few as well as choice; men of high character and position—perhaps, even men retired wholly or partially from active life. The lady visitors should have access to all rehearsals, lectures, or lessons in which female pupils were engaged. They should be able to exercise great influence on the tone, not only of the female department, but of the whole institution. Their advice would often be of great value to the council. At Bedford College, several ladies are members of the council. The Committee of Education should consist of the whole body of professors, who should have the sole management of everything relating to the work of the institution. The principal should be a musical professor, but should not actually teach in the Academy, still less out of it, devoting his whole time and attention to the general superintendence of the work of the academy. Being a musician, he would command an amount of attention from the professors, and obtain an influence among the students, which no mere amateur could possibly hope for. Not acting as a professor, pretexts for jealousy and suspicions of favouritism (though nothing can render these impossible) would be reduced to a minimum. The body of professors (who would form the committee of education) should be formed with a view to instruction in every department of musical science and skill; if a school of musical drama were connected with the institution, instruction also in stage business, fencing and dancing must be added. The different classes of pupils would be (1) free; (2) partially free; (3) paying. Every pupil, without exception, should study harmony and the pianoforte. Every male pianoforte student should learn an orchestral instrument. Choral practice should be given (the attendance at which should be compulsory) at least twice a week; and the same with orchestral; and general rehearsals once a week. The suggestion which Mr. Chorley has made as to approximate uniformity of method of teaching, I think deserves consideration. Much freedom in this respect must be allowed to each individual professor, but mutual agreement as to many things is not unattainable. For instance, our musical nomenclature might be made more consistent and symmetrical; we might get rid of absurd expressions, such as "superfluous fourth," "extreme sharp sixth," &c. So with regard to the names of notes. In France, and a great part of Italy, the syllables Do, Re, Mi, &c., are exclusively used, not only by musicians, but even by makers of instruments. In England, these syllables are used by some persons exclusively; by others, only in reference to singing, and used in half-a-dozen different methods. I think the Academy might do a great deal by a readjustment of these things, and by setting an example of uniformity in regard to them. The Academy should on no account take boarders, and should undertake nothing further than the musical instruction of the students. It might authorise or sanction boarding-houses for students whose relatives lived at a distance, and the principal ought to look after these.

898. Would you point out what you consider are the main differences between the system you have been so good as to sketch and the present constitution of the Royal Academy of Music?—I am really not sufficiently acquainted with the present working of the Academy to do this confidently; but, so far as I understand, there are many very considerable differences, one of the most important being that the professors of the existing Academy form no distinct or authorised body—have no share in the government of the institution. I have been told that the board of professors—so called—has several times been abruptly dissolved by a sort of *coup-d'état*. Then again, what I call the council—in the existing Academy, the board of directors—certainly did, during the time I was connected with the Academy, interfere very actively in matters of a professional kind; and I must say, I think greatly to its disadvantage.

899. You would, in any new constitution or new regulations, draw a broad line between what may be considered business management and professional management?—Decidedly. I would define the duties of either body very accurately. Of course there must be a court of final appeal.

900. But not on questions of music?—Only where there were irreconcilable differences of opinion among the professors.

901. Do you not agree with the evidence given by more than one witness as to the undesirability of compelling students to learn the pianoforte, especially singing pupils?—If the object of an Academy were to create a certain number of mechanics, and to secure a slavish and exclusive practice of one branch of industry by ignorance of every other, I should certainly agree with it. As I conceive the very reverse of this to be the case, and that it is the business of an Academy to educate its alumni as liberally as possible, I disagree with it entirely. It is hardly possible to study music well without some knowledge of the pianoforte; at all events the study of music is greatly facilitated by it.

902. Are you aware that the Royal Academy has notice to quit its present premises?—Yes; I have heard so.

903. Do you consider that is an eligible situation for such an institution?—Most ineligible.

904. Are you aware that the Academy some years ago made an application for a site of ground at Kensington?—Yes.

905. Should you think that an ineligible situation?—I think it would be a very eligible one on many accounts. In the first place, an Academy located there would be isolated from other houses, and pupils living in the neighbourhood of the institution might live on the country side of it, with the advantages of fresh air and perhaps less expense.

906. The Academy being obliged to quit its present premises at Midsummer, should you prefer that it should be carried on with the best temporary accommodation that could be provided, or would you suspend its operations during the period that must elapse in providing a suitable building?—I am disposed to think its existence had better be suspended for two or three years. I do not think that would be an evil.

907. You think there would be no difficulty in reviving public and parliamentary interest in the work?—I fear that public and parliamentary interest in the work will have rather to be created than revived, whether now or three years hence.

908. Would it not be rather hard to throw the pupils on the world and not continue their education as well as you could?—In the case of scholarships there would certainly be a difficulty.

909. So with the other pupils—if you have pupils of merit—would it not be hard not to continue their education; or would you provide for them in any other way?—It might be a difficult thing to do so.

910. If the Academy were suspended for three years, it would take as long a time to get into working order again; so that, practically, there would be a delay of five or six years?—I do not think that need be. There are two questions which we are canvassing: one is the carrying on of the present Academy under still more disadvantageous circumstances than at present exist; and the other is beginning upon a new principle entirely. If you could begin to-morrow upon a new principle, I would say by all means do so.

911. Reverting to the question of management, what would you consider to be the relation established between the board of professors and the principal? Should you be disposed to give him very large powers, in the way of control and management—not as to the teaching or the special instruments to be taught, but as to the proper performance of duties in the Academy?—Certainly. Having chosen a principal, I would give him very large but not unlimited powers. He should be absolute in respect to the regulation of the "time-table," and the distribution of pupils into classes; but I do not think he should interfere with the modes of operation of the professors. Indeed, first-rate men would never endure his doing so. I would guard against discrepant or inconsistent teaching, first, by agreement on general principles, and then by taking care not to elect a professor who could not adopt these.

911*a*. Even by temporary arrangements, and in a temporary building?—Yes.

912. Do you think there is more uniformity among the professors in foreign conservatoires in the modes of teaching and the theory of music than is to be found in our own institutions, and in the Royal Academy in particular?—I think that there is in France; but the French are more systematic, or more ready to adopt uniformity in everything; the professors work well together. At Leipsic, I am told, it is the reverse; and that there are great disagreements as to the modes of teaching there generally.

913. Do you consider it a disadvantage that such disagreements should exist?—A very great disadvantage, certainly, but one to which an academy is always liable.

913*a*. So that after all, the system of teaching must be more or less brought under the control of the principal?—Rather, perhaps, under that of the board of professors, as they could protest against the election of a man who would not be likely to work harmoniously with them. The prosperity of the Academy for many years to come—I would almost say for an indefinite period—would depend greatly on the selection of the first set of professors.

914. Do you think the election of professors should be with the board of professors, or that their nomination should be with the principal, and the confirmation with the board of directors?—The board of professors, one of whom—perhaps the chairman of which—the principal would be, should nominate the professors, subject to the veto of the board of directors, or council.

915. You would prefer that the responsibility of the management of the Academy in professional matters should be in the hand of the board of professors, instead of in the hands of the principal alone?—I do not think it should be in the hands of the principal alone. Inevitably, however, the influence of the principal would be very great indeed.

The Chairman stated that he wished to call the attention of Mr. Hullah to the results of a tabulated statement before him, from which it appeared that, at the present time there were in the Royal Academy, in the subject of harmony, 7 professors and 70 pupils; in the pianoforte, 12 professors and 64 pupils; in singing, 9 professors and 48 pupils; in the violin, 3 professors and 14 pupils;—showing that the work to be done by the professors is very disproportionate to the number of persons who receive the instruction. What was the security that the like result would not follow from giving a board of directors the origination, so to speak, of the professors?—The state of things you describe has come about by degrees. It is inconceivable that any body of directors should "originate" anything so absurd. The same causes would, no doubt, bring about the same results; but it is most improbable that the same causes should ever again come into operation.

915*a*. You do not object to a system which makes the responsibility for results as individual and close as possible?—Certainly not.

916. Have you any suggestions to offer to the Committee with respect to what the building should be to meet the requirements of an Academy?—Only in the merest outline. The first thing, of course, is a good concert-room—not too large—say 120 feet by 60; that is, about the size of St. Martin's Hall, with accommodation for an orchestra of 150 to 200 vocalists and instrumentalists.

917. How many persons would that accommodate, exclusive of the orchestra?—That depends upon how they are placed. We have had an audience of about 2,000 in St. Martin's Hall, but the seats were closely packed, and some hundreds were obliged to stand. A room of the size I have named would allow of comfortable seats for from 800 to 1,000 persons.

917*a*. The concert-room you contemplate would be more for practice than for performances?—I would have performances, as I have said already. But there is great advantage merely in practising in a room of such size. No safe estimate can be made of the power or even the quality of a voice in a small room. In addition to this, there should be a chamber concert-room for quartets, &c., capable of holding a moderate number of people. If instruction is to be given for the stage, there must be a small theatre for practice. They have a theatre at the Paris Conservatoire, which is also used as the *Salle des Concerts*, for which it is much too small. Then there would be required a lecture-room large enough to accommodate the whole of the students, with provision for display of experiments and the exhibition of diagrams; also a set of class-rooms, separated by thick walls; of course, a library; and, if possible, a museum of musical instruments; together with apartments for the principal and the lady superintendent. The library I regard as a most important feature of the institution. London is very deficient in this respect, and what there is is by no means easily accessible. I do not know, for instance, where at this moment I could see a complete set of scores of Haydn's symphonies—even of those which have been printed. The British Museum, as a library of reference, is worth little to the average student. It is, no doubt, rich in curiosities—as such a library ought to be—but the average student does not want curiosities.

918. Are you aware that the authorities of the British Museum have been making great endeavours to increase their stock of music, more particularly of the class you are speaking of?—I was not aware of it. At the same time, the proper place for a musical library would be such an institution as we are discussing. A museum of instruments is an old notion of mine, but it has never yet been realized here: every year's delay makes its formation more difficult. They have one at the Paris Conservatoire.

919. Are you aware that that collection was offered to the English Government before it was obtained by the French?—No; but I am not surprised to hear it.

919*a*. Do you know the collection made by the late Professor Donaldson at Edinburgh?—Quite well. It consists principally of apparatus for the exhibition of acoustic phenomena; and, in that respect, it is perhaps the most complete collection ever made. I believe a great many people would contribute to such a museum as we are contemplating.

920. Do you consider that useful relations might be established between the Royal Academy of Music and the various training schools throughout the country?—I think they would occasionally send students.

921. And also with military bands?—No doubt. That is a very important department of music. The proposed Academy would be the proper place for the education of bandmasters. At the present time much of the music for military bands is badly scored.

922. Are you aware that the bandmasters of the three regiments of Guards were pupils of the Academy?—I am very glad to hear it.

923. Have you formed any kind of estimate of what the probable expenditure of such an institution as you desire to see in this country would be?—I have not facts enough to enable me to form more than an approximate estimate, but I should think, roughly speaking, about £10,000 a year.

924. You consider it would be necessary to pay the principal a good and sufficient salary?—As he must devote the whole of his time to the institution he would require to be well paid. I would not have him do anything out of the institution, but give it his whole time and attention.

925. You would like to see at the head of the institution a person of the professional standing of Auber or Cherubini?—It does not follow that the most accomplished composer would make the best principal of an Academy.

The committee then adjourned.

Nineteenth Ordinary Meeting.

Wednesday, April 18th, 1866; Professor Owen, F.R.S., in the chair.

The following candidates were proposed for election as members of the Society:—

Fraser, George C., 62, Tredegar-square, Bow, E.
Grist, Richard, Brimscombe, Gloucestershire.
Knatchbull, Wyndham, 3, Chesham-place, S.W.
Silvy, Camille, 38, Porchester-terrace, W.
Spence, Charles Stenson, Shannon-street, Marsh-lane, Leeds.
Tarner, A. Phythian, 3, Upper Baker-street, N.W.
Thorp, Henry, 27, Piccadilly, Manchester.
Ward, John, 13, Donegall-place, Belfast.

The following candidates were balloted for, and duly elected members of the Society:—

Armstrong, Richard Baynes, King-street, Lancaster.
Ashbury, James, 27, Great George-street, S.W.
Austin, Stephen, Hertford.
Birley, Samuel, Ashford, Derbyshire.
Bryant, Wilberforce, Patent Safety Match Works, Fairfield, Bow, E.
Dutton, Francis S., F.R.G.S., Reform Club.
Fowler, Francis H., 32, Fleet-street, E.C.
Gossage, William, Widnes Soapery, near Warrington.
Gowland, G., 76, South Castle-street, Liverpool.
Holdsworth, Samuel, 54, Spencer-st., Clerkenwell, E.C.
Mander, Charles Benjamin, Varnish Works, Wolverhampton.
Middlemore, William, Holloway Head, Birmingham.
Patterson, W., jun., 2, Dover-place, Clifton, Bristol.
Penson, Richard Kyrke, Ferryside, Kidwelly.
Rowden, William T., Burrage-road Evening Classes, Plumstead, S.E.
Rüst, R. A., 8, Argyll-street, Regent-street, W.
Watkins, Charles A., 10, Greek-street, Soho, W.
Wood, J. W., Custom House, Harwich.

The Paper read was—

THE DISEASES OF MEAT AS AFFECTING THE HEALTH OF THE PEOPLE.

By J. L. W. Thudichum, Esq., M.D.

There has been from early times, and in most countries, a general belief that the flesh of diseased animals was injurious to the health of human beings partaking of it. It cannot be supposed that this belief originated in anything but actual experience, though it must be admitted that of the exact nature of the experience we have no record. Like any other experience which does not result in the deduction of a law, because of the want of any demonstration of the law of causation, the experience regarding the injurious effects of the eating of meat from diseased animals was of a fallacious nature. A prediction based upon it might be as easily falsified as fulfilled. Thus the ideas even of intelligent legislators remained undefined or confused, and benevolent intentions were not rarely perverted into heavy inflictions upon society. Some nations, finding beef injurious now and then, discontinued the use of it; others, suspecting pork, availed themselves of the argument of the uncleanliness of the pig for making its use as a meat an offence against religion. Experience derived from diseased individual animals was extended so as to apply to a whole species, and such ignorance effected a tyrannous generalisation. It excluded one danger, but, at untold sacrifice to the protected; it left full scope to other agencies of the nature or existence of which it had no warning; it raised trifling and harmless anomalies to the dignity of dangerous causes. Such conduct could not invite to imitation, and remained limited to the range of its compulsory power. It even grew more senseless by practice, until at last it appeared to be, and was in fact, little else than a superstition.

The progress of natural and medical science has in our day completely changed the aspect of this question. Observation and experiment have established distinctions not dreamed of by earlier philosophy. So much of the actual has been evolved and brought into the light of day, that there is no room in the human mind for the imaginary. Uncertainty, where it exists in such a manner as to admit of apprehensions, is hedged round by prudent measures; it is the object of ceaseless investigations, carried on by well-tried methods, with the aid of great human inventions, such as microscopes and chemical reagents. There result complete protection, at least in the most important cases, for all those who will take the trouble to know and to see; there result propositions for laws, or actual legal provisions, by which the state or the community undertakes to practice and enforce the protection offered by science. Science is once more shown to be an essential factor of state and municipal government; the human understanding is once more encouraged to persist in inquiry upon all problems.

Within our own time the science of zoology has enlarged its range. From what is termed a descriptive science it has become an experimental discipline. To the comparative anatomy of animals there has been added their physiology. That part of zoology in particular which concerns most the subject of this evening has been extended until it has become a subject of the deepest philosophical study. As such alone, the subject of meat parasites claims the attention of every educated person, even if it did not teach important lessons regarding the introduction of danger or discomfort to humanity. But whereas such a danger clear and well defined does exist, its exposition is the duty of all those who are called upon to exercise their skill in the protection of the health of the public, and its consideration and avoidance the duty of every responsible member of the community.

But we observe a still greater progress in the arena of pathology and practical medicine than in the field of zoology. The extension of anatomy by the microscopic method has vastly increased the range of human knowledge. When, thirty-four years ago, a little worm was discovered in human muscle, the world was in a state of sensation and wonder. Then the foundation was laid for that magnificent acquisition of medical science, the knowledge of the causation, progress, and prevention of that remarkable disease known under the name of *Trichiniasis*. That these 34 years were requisite for this remarkable development any one will admit who studies the single steps which led to our present knowledge. But what is most to the credit of the method which now prevails in medical science is the fact that the main bulk of our medical knowledge on *Trichiniasis* has been evolved, taught, controlled, and summarily entered upon the great record, all within the short space of three years. The imperfections of medicine are inherent in its nature, as a compound science based upon the knowledge of metaphysical, physical, chemical, and vital phenomena. And these difficulties on its own side are increased manyfold on the side of the objects upon which it has to be exercised. But the splendid manner in which the votaries of this science used the light, which originally struck by Owen (whom we are all proud to see presiding over us, and giving the countenance of his great name and dignity to our deliberations), and kindled by such men as Wood, Herbst, Leuckart, Virchow, and Zenker, for the illumination of some dark corners of human existence, for the elucidation of mysterious cases of illness, occurring singly or in batches, or in extensive and fatal epidemic outbreaks, this feat will ever demonstrate to the world that the medical profession appreciate the object of their calling, and are in possession of the means for doing it ample justice.

The scientific consideration of the entire subject of the diseases which man may contract from unwholesome or diseased meat was first begun as a part of that movement which is now known under the name of preventive medicine. That movement originated with, and was forced upon the attention of the people by, the medical profession, who thus manifestly preferred their morality to their secular advantage. The first connected consideration of the diseases of meat was, I believe, effected by Dr. Greenhow, incidental to an inquiry on the influence of food in general. When the sanitary laws, which have acted so beneficially in the metropolis and elsewhere, were at last introduced, the medical officers of health obtained at least a share of that influence and power which common sense demands should be exercised towards the removal of causes of disease. The most important meat markets at least were placed under their supervision. But constant abuses continuing in places where there were no medical officers, or where their authority proved insufficient, or where the magistrates interpreted the law in the same manner as the one who lately decided that ketchup or catsup was not human food, and might therefore lawfully and with impunity be prepared from putrid ox-livers, the agitation on the subject continued. The medical officer of the Privy Council, Mr. John Simon, caused an investigation to be instituted on the prevalence of diseases in cattle used for human food. With that investigation, which was intended to treat the subject from the veterinary point of view, Mr. John Gamgee was charged, and his report is contained in the Sixth Annual Report of the Medical Officer of the Privy Council. This report served as a basis for the proposal of some legal measures which Her Majesty's Government introduced into the House of Commons two years ago, under the title of the Cattle Diseases Prevention, and Cattle, &c., Importation Bills. The House appointed a committee, which, after inquiring into the whole subject, reported the first Bill with amendments to the House; but found it inexpedient to proceed with the second. As it was clearly shown there had been some exaggeration in the information upon which a part of the first Bill was founded, the Government judged it best to withdraw the Cattle Diseases Prevention Bill, and many useful measures upon which everybody was agreed were thus left in abeyance, together with those which appeared to require further discussion and investigation. The Privy Council, under the advice of Mr. John Simon, meanwhile caused the inquiry on the diseases communicable to man by means of meat to be continued in that field where it appeared to offer an immediate practical advantage, and I had the honour of being entrusted with the investigation of the parasitic diseases of quadrupeds used for food, more particularly with those which were communicable to man. My report on the subject is contained in the 7th Annual Report of the Medical Officer of the Privy Council. In the course of my investigations I became convinced that the principal agency for the protection of the people from parasitic diseases would be the general diffusion of accurate information on the subject. I believe that the Council of this Society were guided by a similar consideration when they judged that the subject might prove of interest to an audience such as that which I have now the honour of addressing. Nobody will doubt that discussion clears the views and augments the knowledge even of the most accomplished; and thus, as we are united in intention, our discussion may contribute to clear the way for those protective legal measures which seem practicable, and do not involve unnecessary hardships to any one; while, on the other hand, we may evolve more distinctly the fact that on some important points connected with this question legislation is inexpedient, because the legal remedies which might be thought of are impracticable as regards execution.

By the abbreviation of "diseases of meat," which occurs in the title of this discourse, we have to understand diseased conditions of meat, or results of disease in the animals from which the meat has been taken. Such diseased conditions may be considered under three heads: First, Diseases of a specific nature, which can be transplanted upon man, so that the human subject becomes afflicted with the same disease as that which had hold of the animal when it died or was killed. There is only one disease known to science at present which can have that effect, namely, malignant pustule or anthrax. Now, although it is certain that there are a certain number of cases of this disease in which infection seems to have been brought into the body by mere contact with the hands or mouth of persons, and even by the ingestion of such meat into the stomach, yet these cases are very rare indeed; first, absolutely as cases of disease, and, secondly relatively as compared to the number of cases in which anthrax was inoculated into wounds or transplanted by the poisoned sting of flies. But even of these cases only very few actually occur in practice, so that from our present point of standing, considering as we do principally the diseased conditions of meat which are capable of influencing public health—that is the health of the masses—we can attribute no particular importance to the possible introduction of malignant pustule into the human subject by means of the meat of animals which have been affected with it. And this is the best opportunity for pointing out an important negative result of these inquiries on transmissible diseases, namely, that the so-called specific diseases of animals cannot, as a rule, be transplanted upon man, and those few which can be transplanted can only be so propagated by inoculation. Mere ordinary infection — such as would bring typhus from man to man—never causes the specific disease of an animal to appear in the human subject. Man cannot be infected with the cattle-plague, be it bovine typhus or bovine small pox; it causes him no typhus and no small-pox, even when he is inoculated with the cattle-plague matter. Man can be infected by inoculation with cow-pox, and is by that means protected against the small-pox peculiar to his species, but he cannot be infected by ordinary contagion. It is, in fact, a general law, that each species of animal has its own specific diseases, of which the germs are only reproduced by its species, and communicated from one individual to another of the same species. Species which are related so as to be capable of producing cross breeds may also have a certain liability to certain diseases, but the species to which the disease comes only secondarily, already modifies the type of the disease, so that it becomes less infectious, less severe, less dangerous, and in the end dies out. Indeed, if man were liable to take any of the specific febrile diseases of his domestic animals, he would now be more likely to be in course of being swept off the earth, or to have already disappeared, than to increase in numbers, fertility, and well-being, as in fact he is doing on many parts of the globe. Illustrating broadly, we might say, that if the beef we eat were derived from animals killed while under the influence of pleuro-pneumonia, or of foot and mouth disease, or of cattle-plague, and if our pork came from pigs killed while subject to the scarlet fever peculiar to the pig, we should, nevertheless, not be at all liable to be ourselves infected with this pleuro-pneumonia, this foot and mouth disease, this cattle-plague (indeed, on this last disease we have a large amount of evidence attesting the freedom of man), nor should we be at all liable to be infected by the pig with its scarlet fever. Neither could we infect these animals with our own numerous diseases, excepting the very few transmissible by inoculation, such as small-pox, which may be given to the cow and horse, remaining, however, small-pox, howsoever modified by the new species. As a rule, no species is infected by the specific diseases peculiar to another; in those few cases where it is otherwise, the infection has to take place through a wound, as in rabies, or hydrophobia. This law of nature is a necessity so self-evident as to require no further discussion, and no illustrations could mark it out more strongly by contrast than the late aberrations from its teaching, such as the floundering and illiterate statements about the identity of cattle-plague and human small-pox, or the oration lately delivered before the Medical Society of London, which had for its title "the unity of disease," and happily, as regards the credit of the science of medicine, a surgeon for its author.

In the second class of diseased conditions of meat we have therefore to place all those which, while produced by disease specific to the animal species, do not cause the same specific disease in man, nor any other disease specific to man; but either produce no disease at all, or, if producing a pathological effect, cause a process which stands to its cause in the relation of poison to poisoning, of arsenic to arsenical poisoning, but not in the relation in which typhus infection stands to typhus fever. I am fully convinced of the truth of the allegations which have repeatedly been made, that the use of pleuro-pneumonic beef, particularly in the form of sausages, or of steaks, both being frequently underdone, has caused symptoms and processes of severe indigestion. Vomiting, purging, cramps, collapse, and even death, in sixty similar cases, seem to have been thus produced. But in all these cases the evidence lacks that precision, in one particular part or other, which science has a right and an absolute necessity to demand. Thus in the sixty cases of illness from pleuro-pneumonic beef sausages, "muddled" pork fat, that is, pork fat in a state of semi-putridity, had been added, and the shares of the beef and the pork in the production of the illness could by no means be separated. At present medical science pronounces with Mr. Simon, the medical officer of the Privy Council, that we are not in possession of any evidence of injury to human health from the consumption of meat, in a cooked state, of animals having different epidemic diseases, such as pleuro-pneumonia, aphtha, and the steppe-murrain. Mr. Simon further says that if the statements made about the prevalence of pleuro-pneumonia be moderately or reasonably correct, all of us must every now and then be eating pleuro-pneumonic beef. Every now and then, on a particular day, a whole household would eat it, and then if the meat were capable of producing suddenly injurious effects, we should be having in the whole household, as it were, an outbreak of poisoning. We may further agree with Mr. Simon in allowing that the long-continued or large consumption of such beef may produce remote effects; but even this is not proved.

Just because the evidence relating to the effect of meat thus diseased is of the slenderest kind, it is necessary to assume an attitude of expectation, and to form a resolution for further observation and inquiry. All mankind loathes to eat of an animal which has died from the effects of disease. The objection to the consumption of diseased meat is much diminished by the ceremony of slaughtering, and perhaps there may be good grounds for this abatement of the objection in the fact of the blooding of the animal, whereby the main carrier of diseased action is probably removed. But even the proposition to eat of an animal thus slaughtered retains a part of the disgust with which mankind considers even fresh carrion. For myself I can say that I should not easily consent knowingly to eat meat from an animal which had been killed while under the influence of a febrile disease infectious to its species. The diseased condition effects an ideal taint perceptible to my aesthetical feeling, just as putridity effects a taint perceptible to my simpler senses. The effect of either is that insuperable objection called disgust, which I should always consider as a sufficient warning of coming injury, and which I am sure no fine feeling person will on argumentative grounds ever be able to disregard or subdue without sensible consequences of a disagreeable nature. Therefore, if very many of us possessed the cheerful disposition of those inquirers who lately made hearty meals upon cattle-plagued ox hearts and sheep's hearts, and pork cutlets infected with the bags of psorosperms, they might perhaps raise no objection to the sale of cattle plague beef, &c., and experience as little sensation as was produced by the above dining experiments. But those whom nature has made of finer stuff might reasonably demand to have a choice in the matter, and to be able to select their meat as nearly healthy as can be. On the whole, I think it a reasonable proposition that all meat upon which the evidences of disease can be discerned should be condemned, and that all meat coming from diseased animals, if allowed to be sold at all, should be caused to be offered as such in the market, although it be of ordinary appearance. But the practical difficulties in carrying out any such idea are so enormous, that I have little hope of relieving even my own disgust for pleuro-pneumonic, or otherwise diseased meat, by any other agency than that which is imputed by a libellous invention of man to that sagacious bird, the ostrich, namely, the affectation of ignorance. I will ignore objectionable practices, which I have seen in slaughter-houses with my own eyes, because I am on the other hand convinced, from frequent inspection of our principal London meat markets, that by far the larger quantity of all meat offered for sale is of good or useful quality and healthy, and for the rest I will, in common with others, keep a sharp look out to collect data towards the decision of points which our present knowledge leaves in doubt or obscurity.

In his evidence before the Committee of the House of Commons in 1864, Mr. Simon also said that, in his opinion, a good many of the cases of injury to health which had been published, and supposed to be from diseased meat, had really been injury to health from meat in particular stages of putridity. That had been especially the case with veal, and perhaps also with pork. These kinds of meats seemed liable, under some circumstances, to a peculiar kind of putrefaction, in which they need not be flagrantly offensive. If eaten in that state they injured considerably, or perhaps killed. A similar process of modified putrefaction has been observed in venison, in the bodies of hunted animals, and in animals which died a slow and torturing death in nets or traps. Liebig relates an important case of the latter kind in his "Chemical Letters," and a case of severe illness caused to several members of a family, as also to their cat, by a meal of Canadian partridges, was, a few years ago, credibly related to me. All these and similar cases and orders of cases have to be closely considered in an investigation of this kind, although we must admit that they are rare, few and far between.

The third class of diseases communicable to man by means of the flesh of animals are those which are caused by entozoa, and hence are called parasitic diseases. They are diseases as specific in their nature as any other human diseases, and obey natural laws of causation and transmission with the greatest fidelity. But they have this peculiarity, that they exist by means of a curious reciprocity between different species of animals, more particularly the calf, ox and cow, and the pig, and also, though only indirectly, and through the instrumentality of the dog, the sheep, on the one side, and man on the other. In other countries man keeps up a reciprocity with certain kinds of fish, and in very rare cases with molluscs, with which cows and sheep carry on a lively trade in parasites. From his veal and beef man derives the great hookless tapeworm, the most troublesome and obstinate animal of that shape; from his pork he gets the common hooked tapeworm; giving in his turn to both calves and pigs the germs of the entozoa which nestle in the flesh, and become again larvæ of future parasites; from the sheep and ox he derives, through the instrumentality of the dog, the germs of that painful and frequently fatal disease termed echinococcus or cystic disease; from the pig, lastly, he gets that awful scourge which we now know by the name of trichiniasis. We will illustrate the various parts of the history of these diseases, and of the agents concerned in them, a little more in detail, and exhibit the agents themselves, on a colossal scale, by means of the oxy-hydrogen microscope, on the white screen on the wall before you.

There is in this glass a piece of veal, which, while it was fresh, presented no particular appearance to ordinary observation. On close inspection, however, a small cavity could be here and there discerned, and in it a little bladder. When we carefully removed such little bladder and placed it under the microscope, we perceived that it was organised, and was in fact a bladder-worm, with its head and neck inverted inside the cyst. You here see the bladder-worm, or bladder-tail, cysticercus. [A microscopic picture No. 1. was thrown upon a large white screen.] You perceive a round bladder, with an aperture on one side which leads to the cavity of the involuted head. The neck and head are covered with calcareous corpuscles, each of which is clearly depicted. There are four large sucking disks distinguishable, and between them a fifth smaller one. No hooks are perceptible. Here in the corner of the field is an everted head, and the bladder in which it was inverted is destroyed. Now if any person were to eat such veal in a raw or underdone condition, he would very likely after a month or so find himself inhabited by a large taenia, which, in about three or four months, would give him considerable trouble, and cause him no mean symptoms of illness, ranging from sickness to epilepsy. You see here the head and neck of this taenia. [It—No. 2—was shown upon the screen.] You perceive the same character of head as in the bladder-worm, four large suckers and a small one between them, and much pigment all round. This was evidently a very powerful animal, and perhaps seven or eight years of age. It is the most obstinate human taenia, and can but rarely be expelled by medical means together with the head. Mostly the head remains behind, and soon grows a new chain. It reaches an extraordinary length, amounting to 10 and 12 feet. Here is a portion of the body of such a worm, amounting to three links. [The microscopic picture No. 3 was thrown upon the screen.] You perceive the egg-holders, all filled with ripe eggs, say 50,000 in each link. The excretory vessels are injected with mercury. You perceive that they form two longitudinal canals, which run along the entire animal, and at the end of each link are united by a cross canal. At the junctions are beautifully fitted valves, which prevent the recurrence of any fluid towards the head; the vessels can therefore be injected only from the head towards the ripe end, and not in the reverse direction. The position of these canals is shown upon these transverse sections, (microscopic view No. 4 shown upon the screen), which also show some portions of the internal arrangement of the animal; the skin, the contractile layer or muscular system, and the egg-holders full of eggs. Like most taeniæ, this species possesses no alimentary canal, but lives by absorption of nutriment through its skin. This skin is thickly studded with oval corpuscles of carbonate of lime. This, then, is the great hookless human taenia, or *Taenia grandis*, sometimes also termed *saginata*, the fat or sleek taenia, and *mediocanellata*, a denomination which, as being based upon an error, should be abandoned. The cycle of the life of the taenia grandis, then, is completed in three animals. The first animal, a man, harbours a taenia, which produces from 6 to 8 ripe links or proglottids per day, containing, therefore, from 300,000 to 400,000 ripe eggs. The second animal, a calf, eats a number of these eggs, with the grass or fodder, whereupon the embryos, already contained in these eggs, and armed with six sharp prongs each, creep out of the shells, penetrate the intestines, get into the bloodvessels, and travel all over the body of the calf, which thereby is made very ill, and sometimes dies. Ultimately the embryos settle in the muscles, and become the bladderworms of veal which you have seen. These, then, are again transformed into taeniæ in the bodies of people who eat raw or underdone veal or beef.* This succession of stages is a natural law, a specific parasitism; it cannot be altered; the ripe taeniæ cannot live in the calf's intestine, and the embryos cannot migrate and become developed in the human muscles. The calf alone rears the bladderworm in its flesh, and man alone rears the taenia in his digestive organs.

We come now to the second important taenia which man derives from diseased meat, namely, the taenia solium, or common hooked tapeworm. This is contracted by the consumption of pork containing the bladderworm or larva, from which pork, as it has a speckled appearance when it contains many of these animals, is called measly. You here see such a bladderworm, or *Cysticercus cellulosæ* on the screen. (View No. 5 was exhibited.) But, instead of taking a bladdertail from pork, I have selected one from a human liver in an early stage, to illustrate at once the important peculiarity of this species of animal, namely, that it can live in man as embryo, bladderworm, and ripe taenia, and in one subject complete two-thirds of the circle of its life. But in the pig it can only live as bladderworm, and not as ripe taenia. Thus, as regards this taenia, man has a prerogative above the pig. Now let us look at the taenia which is developed when the bladderworm, the measle, is eaten in raw or underdone pork. (Microscopic view No. 6 shown.) Here you see its head, with four suckers, a snout, and a ring of sharp hooks, which it uses like anchors for fastening itself in the tissues of the mucous membrane. Whenever I see this colossal picture I am reminded of the line in Goethe's poem "Mignon:" — "In Höhlen wohnt des Drachen alte Brut!" (In caverns dwells the dragon's ancient breed.) Of the power of these animals you can form a conception from the following specimen. (View No. 7.) Here you see again the head and forepart of the taenia, but its hooks are imbedded in a portion of the mucous membrane. The power of the excited intestine could not overcome the power of the worm's claws, but they had to be torn out of the mucous membrane together with the piece in which they were fastened. A worm so imbedded can occasionally be lifted up entire, and pulled like a string, without yielding its hold; to comprehend the nature of these animals one must have studied them active and strong, pliable and warm as they come from the intestines of freshly killed animals. There is a third head (view No. 8) upon which the rostellum or snout, and the position of the hooks with regard to the snout, are more clearly perceived. I will now show you a piece of the body of taenia solium (view No. 9). Here are two links made transparent by artificial means. You see the egg-holder with its tree-like branches full of eggs. Here you see numerous other glands, which lead to this coil, or curl, called cirrhus, and out of the lateral aperture. These show that each link is an hermaphrodite creature. At the margins you perceive the excretory or water-vessels. I have made these water-vessels and the egg-holders more distinct in this specimen (view No. 10), in which they are both injected with mercury. And in the next specimen I have adopted another means of making internal organs visible at an early stage of development (view No. 11). I have dyed some links with carmine and made them transparent, and can now distinguish this triangular or germinal gland, and many minutiæ, which are of importance in generical courses of study, but are here only brought forward to give you an idea of a few of the means by which all these curious and remarkable facts are ascertained.

The cysticercus occurs in man sometimes in the brain, and then mostly causes death. It is not rarely observed in the eye, and is successfully extracted by oculists. Sometimes it causes tumours under the skin, and sometimes, as in the case already given, it is in great numbers in the liver. In these respects it imitates other taeniae, which inhabit these places with a kind of preference, or with exclusiveness. We therefore learn much by the comparison of the life of one taenia with that of another kind. Thus, as an illustration, I will show you a few parts of the taenia, which, as the diving bladderworm, lives and frequently occurs in the sheep. The ripe taenia lives in the dog, and can easily be produced by giving the dog bladderworms to eat. Well, here is the head of this taenia (View No. 12), and two rings of hooks, seen like a basket. The taenia itself is very like the *T. solium*, though shorter and smaller. But here are some of its last links, which it would be difficult to distinguish from links of the human taenia. Indeed, these taeniæ were often confounded before their relative developments were known. Now please observe the character of these three separate animals, for such they now are, moving and living alone and detached from the chain on which they lived and grew. (View No. 13.) This first proglottid does yet contain some eggs. This second one (View No. 14) you see contains very few, and this third one (View No. 15) does not contain any eggs at all. They are all expelled. Living and active as this animal was when I found it, it was preparing to leave the body that had given the place, warmth, and food for its development. It had fulfilled, to the very end, its entire mission, and now decrepid and sexless, prepared to make room for younger generations.

I mentioned just now that the cysticercus of the *T. solium* could become developed in the human brain. This induces me incidentally to allude to a bladderworm, which lives almost exclusively in the brain of animals, particularly sheep, more rarely horses. In sheep it causes the well-known disease called gid, sturdy, or turning sickness. I here show you such a bladder, which I have taken from a sheep's brain. (View No. 16

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* This transformation, originally discovered experimentally by Leuckart, has been lately confirmed in this country by experiments made at the Royal Veterinary College by Professor Symonds and Dr. T. S. Cobbold (the author of the well-known treatise on Entozoa), under the auspices of the British Association for the Advancement of Science. An account of some of these experiments has been given by these inquiries in the proceedings of the Royal Society. Dr. Cobbold has informed me that the bladder-worms in their second calf had, after one year and some months, during which time the animal had been kept at the Veterinary College and become a heifer, on the killing of the animal a week ago, been found dead and calcified, so that he and his collaborator saw no objection to selling the meat for human food, and so disposed of it.

was shown upon the screen.) You see that one bladder contains many hundred inverted taenia heads; each of these is capable, when eaten by a dog, to grow into a tapeworm, the taenia coenurus. Here (View No. 17) is a head of this bladder which I have everted, and which will give you an idea of the appearance of this taenia, which lives exclusively in the dog. Thus we have already made the acquaintance of two kinds of parasites which complete their circle of life between sheep and dog, but never affect man. But the next taenia which I must mention, although completing its circle between cattle generally and the dog, can also complete its circle of life between man and the dog, man taking the place of cattle, as in the case of the cysticercus cellulosæ we have seen him develop the peculiar capabilities of the pig. Now, as this form of bladderworm (View 18, Echinococcus) which affects man is relatively one of the most frequent and incurable parasitic diseases, it is important that people should have accurate knowledge on its life and mode of propagation, in order to be able to protect themselves, and particularly their children, from it. In his evidence before the Parliamentary Committee on the Cattle Diseases Prevention, &c., Bill, given in May, 1864, a well-known physician committed himself to the following statement. (See "Report of Select Committee," &c., p. 58.)

1277. Is there any other parasitic disorder derived from consuming diseased meat upon which you can give us any information?—One such disorder, which is more common than is usually supposed, is a large tumour in the liver, called cyst of the liver.

1278. What is the meaning of the word "cyst?"—It is the Greek for bladder; a bladder containing a large quantity of liquid. These bladders are really a stage in one development of a kind of tapeworm.

1279. It is a parasite in the body?—Yes; and I have known it produced by the eating of underdone pork.

1280. These cases came under your own observation?—Yes; I observed one case of two sisters in a family.

1281. How did you trace that to the consumption of underdone pork?—Eating raw pork is a thing which few do, and which still fewer would confess; but in the case of these two sisters I put what lawyers would call leading questions, and they both confessed that they had been in the habit of eating raw pork.

1282. Mr. Cox: Underdone pork?—No, raw pork.

It is a great pity that this sort of information should be styled evidence, for the only evidence in the case is that of the want of information on the part of the gentleman who gave it. Cystic disease of the liver, or *echinococcus*, the bladder-worm whose internal heads you now see on the screen, cannot be communicated to man or animal by the eating of diseased meat. The infection is carried thus:—The dog devours the *cysts* or bladders containing these heads; each head grows in its intestine into a very minute tapeworm, of only five joints; in this way a dog may harbour hundreds, nay thousands of these little creatures. They drop their last joints, and then their eggs, and both joints and eggs leave the dog's intestines. Now if these eggs are swallowed by a child, or a lamb, or a calf or a young pig, they become developed into embryos, which penetrate into all parts of the body, and settle and grow where they find it most convenient. Their prolific nature and longevity make them ugly customers, for they produce an infinity of heads, which grow all the year round like figs on a tree in summer time. Then they produce secondary, tertiary, and many more generations of bladders, one within the other, or by the side of the other, until a tumour, from the size of a fist to that of a man's head, and weighing up to 40 and 50lbs., is produced. Then the poor patients come and want relief at any price. Or the ox, sheep, or whatever animal it may be, has to be killed on account of incurable sickness. Of course the dogs again get the offal from the animals, and thus this dire disease is perpetuated. It is thus clear that every organ of an animal containing these *echinococcus* bladders is an indirect danger to the community, and should be seized and destroyed, and never be allowed to be eaten by dogs. And the 600,000 dogs running riot in this country as well as in others should be watched, cleansed, fed, and kept in-doors; or diminished in number by a wholesome tax vigorously enforced. Sometime ago an eminent statesman, with whom I was conversing on the loss of life from hydrophobia, said to me that legislation on dogs was impossible in this country. But I was not so sure that some improvement might not be expected from the increased knowledge of the people and a reformed House of Commons. The most dangerous bladder-worms of man and his domestic animals all came from the taeniæ of the dog. We might admire the arrangements of nature, but, nevertheless, endeavour their correction, just as we exterminated wolves, vipers, and vermin of all sorts. But I granted that legislation on this and other sanitary matters would not be so successful as it might be until this country possessed a Ministry of Public Health, Public Education, and Agriculture.

However, we must admit that in the interval these matters are not altogether neglected either by science or the authority of the state. But not to interrupt your entertainment longer by argument, however germane to the question, I proceed to give you a few further illustrations of the nature of parasitic diseases, which man receives through his meat.

There is an entozoon peculiar to Switzerland, particularly its lake districts, which is probably communicated through fish. (View 19. Body of *botriocephalus*.) It is also observed in the south of France and in Finland. Its juvenile condition is, however, yet wrapped up in mystery. Meantime you here perceive the structure of a piece of the ripe animal. Man also, in rare instances, harbours a parasite which chooses the gall-ducts of the liver as his residence, and he probably obtains the young animals from mollusks accidentally eaten. But the true home of this animal, which is a social creature, is the liver of the ox and sheep. (View 20. *Distomum hepaticum.*) There in the market you may buy a hundred livers and find flukes or flounders in each of them. Here (View 21. Intestine of *distomum*) you see still more of the organisation of this animal than in the first specimen. And to show you that parasites exercise a very remarkable choice as to the organs of the animals in which they live, I here exhibit to you a threadworm, or *strongylus filaria* (View 22), which lives in the windpipe and lungs of cattle, particularly lambs, and suffocates them in great numbers. This specimen comes from a victim of an epidemic which occurred last autumn in Lincolnshire. This *pentastomum* (View 23) lived in the human liver, and its parents in the nose of a dog. Here is such a mother of a family. It is not a true entozoon, but a hybrid between entozoa and epizoa, a transition from class to class. Is is an arachnide, like the acari, the itch and mange-mites, and those remarkable mites which a few years ago appeared at St. Peter's Church, Colchester, and drove congregation, churchwardens, and clergy out of the building. In commemoration of the event, I gave to the mite which I had discovered in the human skin years ago the new name of *Sarcoptes sacrilega.* The *pentastomum* is such a *sarcoptes.* While young its meat is human or rabbit's liver, but later it lives upon inflammatory products which its presence causes to be secreted in the nasal cavity of the unfortunate dog which happened to smell at rabbit's offal. Thus nearly all the organs of the body have their occupants; there remain but the muscles, a third of the weight of the body, to receive a peculiar tenant, whose acquaintance we have not yet made this evening.

This peculiar tenant of the muscular tissue is the flesh-worm, or *Trichina spiralis.* Here is a piece of human muscle, a glance at which will best explain the appearance which first drew attention to this subject. White specks, of calcareous hardness, disseminated all over the muscle, blunted the dissecting student's knives, and we know now from the testimony of many persons that they have seen those specks and had their knives blunted as long ago as 1812, 1820, 1828, and later. But nobody thought or said anything about those calcareous specks or capsules before Mr. Hilton, of Guy's Hospital, who published a notice concerning a case which had occurred in the dissecting-room, where he taught as demonstrator of anatomy. He believed them to be minute cysticerci, a surmise which was less distant from the mark than that of the late Dr. Babington, who endeavoured to see whether they were not encapsuled maggots or larvæ of flies. It was not until these capsules came under the scrutiny of our honoured chairman, Professor Owen, that their true nature was directly and clearly evolved. Each capsule was found to contain a worm, which could be evicted from the capsule, and be observed to move. Seldom has a discovery in natural history created such a sensation throughout the civilised world as this discovery of the trichina spiralis by Richard Owen. And I may add that seldom has a discovery in natural science led to such important consequences for the safety and well-being of a great portion of mankind. You see here (View No. 25) trichina-capsules, imbedded in human muscle, in the state in which they are frequently met with. Here is a specimen (View No. 25) of trichinous capsules from a German who died in London about a fortnight ago. These capsules are the thickest I have ever seen, and as the case is very remarkable and teaches some new points on the longevity and importation of the trichina, I will give you an account of it.

On March 26th last a manufacturer of Bow, a German by birth, W. R. Bischoff, aged 58 years, was driving his cart in Whitechapel, when his companion perceived him suddenly to be seized with a kind of fit, and immediately after to be precipitated from the cart on to the pavement. He fractured his skull, and died on the 27th, at the London Hospital, of compression of the brain by blood. The *post-mortem* examination was made the same evening, and on the muscles of the cranium being incised, they were found to be full of trichina capsules. The muscular system was now carefully examined, aud found everywhere to be thickly dotted with these formations. The mucous membrane under the tongue was examined, and it was observed that the cysts could be clearly perceived through the inviolate membrane. The cysts were found in all the voluntary muscles, and were as frequent in the muscles of the plantar surface of the foot as anywhere else. In all the muscles the number of cysts was greatest towards and near to the tendinous insertions. I have here a mounted specimen of one of the muscles in front of the neck, which will illustrate that remarkable appearance. The capsules were white, hard, and very thick. They broke only under great pressure, and blunted the edges of my anatomical scalpel very easily. Their tenants had been believed to be dead, but I evicted a number of them at the London Hospital, in the presence of Dr. F. Morell Mackenzie, who had been kind enough to draw my attention to the case.

They were living, well-shaped trichinæ, which moved readily while warm. The number of these worms contained in the body of this man I estimated at about 40,000,000. A microscopic specimen of the flesh would frequently show upwards of fifty of these capsules, and there were parts where the muscle seemed to consist of almost nothing but such capsules.

I paid a visit to the widow of the unfortunate man, and learned from her—an Englishwoman,—that her late husband had been born at Bremen, but had lived in England since his twentieth year. She had been married to him thirty-five years, and during that time he had never been away from London. About thirty years ago he had "rheumatic fever," which was very painful, and laid him up for some time. But ever since he had been in good health, with the exception of some indisposition about thirteen years ago, said to have been caused by losses in trade, and which did not confine him to his bed. He had during the last seventeen years been a member of a sick-fund club, but never required its assistance. He used to eat raw German sausages, and consumed the last one on the Friday before his death. All the sausages he ate were imported. Latterly his hands had been trembling, he had often complained of being unusually cold, and his friends had thought that he was breaking up.

Here, then, we have a case of trichiniasis, with an enormous number of parasites, and yet no later record of any corresponding disease than the rheumatic fever thirty years ago. From my personal experience in upwards of a hundred cases of trichiniasis, I find it quite impossible that the immigration of these trichinæ could have taken place without concurrent very severe symptoms. One might think of small infections repeated at intervals, but there are no data whatever to support such an hypothesis. Enough, I soon came to the conclusion that these trichinæ were thirty years old, and that the "rheumatic fever" which the man had thirty years ago, was actually the acute attack of trichiniasis, the disease caused by the immigration of the parasites which I now beheld in the muscles and capsules.

I instituted some experiments upon animals, particularly old and half-grown rabbits, dogs, and rats. They were given some of the trichinous flesh at intervals, and some of the rabbits were then killed and the contents of their intestines examined miscroscopically. I was assisted in the search by Mr. Norman, the well-known microscopic artist, but not a single intestinal trichina was met with. The capsules and trichinæ in them were entirely digested. In one case—a half-grown rabbit—I so arranged the experiment as to be able to examine the intestines at various stages of the digestion of the trichinous flesh. Some flesh yet in the stomach had already lost all the capsules and trichinæ, although the muscular fibres, and their arrangements, with hollow spaces between them, were yet perceptible. In one rat a very few trichinæ were found, partially advanced in sexual development. This experiment is not yet complete, as some animals still remain to be examined. But, with the exception of one dog, they have shown no symptoms; I therefore conclude meanwhile with the reservation implied by these pending experiments, that most of these trichinæ in the thick capsules were so old as to have lost their ordinary power of resisting the chemistry of digestion and *à fortiori* their power of propagation.

Thus far, then, this remarkable case teaches, 1st. The probability that trichinæ can be imported in raw German sausages and cause trichiniasis in this country. 2nd. That muscular encapsuled trichinæ may live thirty years; but that 3rd. If strongly encapsuled, they are, though living unquestionably, (the fact was specially ascertained at every feeding experiment), yet in most cases unable to withstand the powers of the stomach of various animals, and, consequently, but little capable of infecting these animals with new trichinæ. This feature is the first offset, so to speak, in favour of the species of animals on which the trichina preys. Most other circumstances of the life of animals and man, excepting only cooking, are greatly in favour of the success of the flesh-worm.

Ordinarily, when encapsuled trichinæ are eaten by man or animal, the capsules are digested, and the trichinæ set free. They now pass into the intestines, and there propagate themselves very quickly. Each female produces about one thousand young trichinæ in the course of a fortnight, and ushers them into the world alive, and quite prepared to eat their way to their final destination. Here (microscopic view No. 26) you see a number of ripe female trichinæ. On close inspection, you can distinguish the ovary in the posterior part, and then the uterus with horse-shoe-shaped incipient monsters. Here you see them crowded, and evidently anxious to be separated from their mother. The male trichina is only two-thirds the length of the female, but at its posterior extremity is ornamented with two horn-like prolongations. There is one male to about three or four, and sometimes more, females, so that for the trichinæ polygamy is a law of nature.

The young trichinæ immediately pierce the intestinal walls, and obtain access to all the tissues of the abdomen. The greater number penetrate directly into the blood-vessels, or indirectly into them through the lymphatics, entering the circulation with the chyle. A few get also into the abdominal cavity, and remain there or go further. On the seventh day after an animal has taken trichinous meat, the young trichinæ are found in all the tissues. It was believed that they get there by a process of boring in lines as straight as the crow flies. But in my researches upon upwards of one hundred animals, I have clearly shown that this view of the migration of the young trichinæ is untenable, and that they are distributed by means of the blood-vessels. In every capillary system some foolish young trichinæ think that they had reached their destination, the flesh. They consequently penetrate the walls of the blood-vessels, but when they are on the other side they are undeceived. The liver does not much arrest them, as there the passages are wide. But in the lungs many make the mistake of passing into the pleural cavity, and these mostly perish. The majority, however, get into the arterial blood. Some immediately go into the heart, but the heart does not allow them to remain; they are knocked about so much, and have so many stones, in the shape of nuclei of the sarcolemma, thrown at them, that they one and all quit the heart, and mostly die in the pericardial cavity. Then some ascend to the brain, and make it very restless. But brain is not food for them, and again they die. And so on with every tissue except the cross-striped muscles, which are subject to the will,—the actual red flesh. In that the trichinæ reach their destination. As the arterial blood is distributed all over the body, the trichinæ reach all the voluntary muscles without exception. They penetrate into them, lastly into the elementary single contractile fibre, and then their greatest ravages begin. They eat the contractile contents of these fibres away; these contents lose their mechanical arrangements and their contractility, and are transformed into bags of soft granular detritus. Of this detritus they now eat for about three weeks, perhaps attacking and destroying during that time several muscular fibres each, and grow to their full size. Then they coil themselves up spirally, being before straight and outstretched, and pass into a kind of trance or pupa state. The sarcolemma or sheath in which the contractile matter of the fibre was contained before the trichina ate it, now throws out exudation matter, which encloses the trichina on all sides, as the white of an egg encloses the yolk. This matter is firm at first, but becomes soft afterwards, ultimately a thin fluid, perhaps because the trichinæ use it as food, and replace it by excretory matter. The membrane further throws out many nuclei, which are particularly numerous at each end. Ultimately the sheath collapses in all parts, except where the trichina lies, and now that remarkable phenomenon, the encysted trichina, in an oval or lemon-shaped capsule, with a knob at each end, and a tapering parcel of fat projecting from each extremity, is completed. Calcareous matter, mostly carbonate, now encrusts the membrane, and this crust makes the capsules appear to the naked eye as white bodies; to the eye looking through the microscope, however, as black impenetrable masses. Mostly this calcification takes place at a late period, and the more lime is around a trichina, the older we may judge it to be. In this rabbit, however (the living rabbit was exhibited), the course of encrustation has been different. Ten weeks after immigration, which took place upwards of two years ago, the capsules were calcified and black, but now they are mostly quite transparent and soft, so that the trichinæ can with ease be seen inside them, and can be perceived to move within the capsules. I shall exhibit to you this phenomenon a little later. Now we will look over a variety of muscular encapsuled trichinæ, and I will explain the figures by running comments. Here trichinæ from the masseters or jaw-muscles of a rabbit, which died from tetanic trismus, or closure of the jaw. (View No. 27.) The live rabbit which you have seen also had this same symptom, explained by what you see, and had to be fed for a long time with milk and rice flour, which was injected daily into its stomach with a tube. Here are some further illustrations, each elucidating a separate point. (Views No. 28 to 35 were shown.) We must now consider the disease caused in man, by which the fact that he has eaten some trichinæ can be recognised. You know that there have been in Germany a great number of epidemic outbreaks of this disease. This circumstance gave a great many opportunities for observation, and I availed myself of some of them to go in person and study the disease on the human subject. Thus I observed most of the severe cases of the epidemic at Stassfurt, Prussia, which affected upwards of 300 persons. From some of the earliest cases, which were already in the stage of incapsulation, I excised a few slices of muscle from the arm, an operation which I twice performed at the desire of the patients themselves. Here is a preparation from the arm of an intelligent man, C. Oertel, who was curious and almost delighted to see his own disagreeable lodgers under the microscope. (View No. 36. Trichina from the arm of C. Oertel, of Stassfurt.) I also saw many cases of the Dessau epidemic, and some remnants from former outbreaks. As I had studied the disease upon pigs, rabbits, dogs, and rats, I was not a little struck with this curious result of my comparison of the disease in animals with that in man,, namely, that the symptoms observed in a great number of animals, when considered altogether or fused into one case, represent and imitate all the symptoms of the severest form of trichiniasis as observed in man.

Now for a summary description of these symptoms, as they come before the physician, beginning with the severest cases. The physician is called to see a patient, may be at night, who has been seized with cholera. He finds him vomiting, purging, with great pain in the stomach, and collapse. All remedies notwithstanding, the symptoms continue, and on the second or third day the patient dies. Now let us keep up the account of an imaginary epidemic. Perhaps the same night other cases turn up, of a similar nature to the first, but the patients survive the first shock. They then are seized with a very quick pulse, and complete sleeplessness, and with stiffness and pain in all the muscles, particularly the arms. Now the appearances become those of incipient rheumatic fever. Wood's case, and the German's case in Whitechapel, illustrate what no doubt has been a mistake which in former years has been often committed. But a little rigour in the diagnosis will now easily distinguish the fleshworm disease. Here the muscles themselves are painful and swelled, but not the joints or their neighbourhood, as in rheumatic fever. About the seventh day other symptoms supervene, particularly swelling of the face. Now, also, a number of cases present themselves, milder in type, where there is swelling of face and stiffness of limbs, but the patients can yet go about, though unfit for work. A few cases are observed where there is no pain throughout the course of the illness, but great prostration of strength, enormous appetite, and constipation. Some cases walk like persons in a fit of chorea or St. Vitus's dance. Prof. Zenke, in a letter to me, mentioned that the Indian disease, bexiberi, might perhaps be a form of such trichiniasis, a question which Indian practitioners should investigate. The severe cases now enter upon another stage—that of the signs of immigration. They cannot move a limb; all muscles are swelled, hard, stiff like boards, and painful. They are sleepless, and, if they can utter sounds, they lament day and night, in a condition of helplessness and suffering which beats all attempts at description. The dropsy then becomes enormous; there ensue effusions into the cavities; breathing being almost suppressed through the lesion of the respiratory muscles; a host of dangers and discomforts ensue. Then a form of pneumonia or inflammation of the lungs arises, at the end of the third week, which kills many. Pleuritis, with effusion into the chest, also takes place; abscesses form; the projecting parts of the body are covered with great bed-sores, and no remedy whatever has any effect. The doctor can only stand by and observe a remarkable piece of natural history. If the patient gets over this period and into that of complete incapsulation he has a better chance. Few die after the twenty-eighth day from the beginning. A very few, however, drag on particular symptoms, and succumb after weeks and months' of miserable suffering.

The outbreaks of trichiniasis differ much in severity. Thus at Stassfurt, out of 300 cases, only five died; at Hettstäds, 28 out of 158 died; many were invalided; but at Hedersleben, 108 persons out of 360, who were seized, died, being a mortality greater than that of any other epidemic or endemic disease.

The study of this disease is very interesting also from a general pathological point of view, because it illustrates many parts of the laws of the localisation of disease. I might entertain you a little longer on this subject, but should fear to become too exclusively medical, and will therefore pass to the consideration of the origin of the trichinæ, and the means by which they may be prevented from infecting our pigs, and, through them, ourselves.

The fleshworm naturally lives and completes its cycle of life in carnivorous and *a fortiori* in omnivorous animals. Mice, rats, hedgehogs, badgers, foxes, cats, and martins have been observed to harbour these parasites. From one or other of them the pig therefore may obtain its fleshworms, by eating a portion at least of the dead body of an animal so affected. The beet-root origin of the trichinæ, lately trumpeted forth by *Galignani's Messenger*, and often repeated by the press of this country, is a mere fable. You may continue to feed pigs upon raw beet-root. The fleshworm, as I have called it, lives in flesh and in flesh only; it does not live in fat or in brain, or in the liver or kidney.

Now in order that a man may be infected with trichinæ, it is necessary for him to eat a piece of trichinous flesh in a raw or uncooked state. Practically the only course from which in the course of nature man gets his trichinæ is the pig. Therefore, a man only becomes trichinous by eating raw pork. Indeed, the greater number of infections, particularly the severe ones, are caused by this objectionable habit. Fewer cases are due to the incautious habit of eating pork, or sausages, or cutlets, or boiled pork, or minced and fried pork in an underdone state. It is proved by numerous experiments, that the trichina is entirely destroyed by proper cooking. It never survives the temperature of the coagulation of albumen. It follows, therefore, that to avoid all danger of trichiniasis—and let me add, of meat parasites of any kind—it is only necessary thoroughly to cook all meat, and never to eat it in an underdone condition. Some will say, that such was always done in this country, but practically it is not so. The number of cases of tapeworm, and of trichiniasis which we observe in this country, is quite large enough to admonish us to enforce with particular care the old kitchen rules:—Let veal be well done, rather too much than too little. Let pork be well done, until the crust crackles, and the flesh comes everywhere off the bones; until the flaps of fresh bacon or salted ribs are quite tender, and skin and tendons in a gelatinous state. Any meat which is not so cooked, any sausage that is still a little reddish in the middle, any roast pork that still yields a little red juice—reject it absolutely and warn others of it. As for underdone beef, the case admits of a choice; the chance of catching a parasite from beef is smaller than that of obtaining it from veal; then the possession of such a customer is not a danger to life. Therefore as to beef everybody may exercise his own discretion or please himself. But as to pork, let no one trifle with it; I am, from experience, deeply impressed with the awful nature of fleshworm disease, and if by my warning I could prevent even the occurrence of only a few, I should consider my present efforts rewarded.

In conclusion I will endeavour to show you some of the trichinæ, which now for more than two years have lived in this experimental rabbit. The animal contains many hundred thousands. One of my pigs contained at least five millions; C. Oertel harboured some twenty-nine millions; the German in Whitechapel some forty millions. You will appreciate that state of things by seeing them alive in and out of their capsules. Great is the danger, but your protection from it is perfect if you will avail yourselves of it. Man's safety and welfare rest upon the continued exercise of all his faculties, and the practise of the experience of all generations before him. To illustrate this proposition by one of the newest developments of science has been the object of this paper.

It gives me great pleasure to express my obligation to Messrs. Orchard, father and son, opticians, of Kensington, for the very excellent manner in which they have exhibited to the meeting the various preparations above alluded to, by means of their improved oxyhydrogen microscope. Nothing could surpass the fidelity and clearness of definition with which the entire objects and their finest details appeared on the screen. Every single chalk-corpuscle of the cysticerci, every taenia-egg, with its shell distinct from its contents, the tubercles of the hooks and their sharpest points; the organisation, the eggs, embryos, and ripe young of the female trichina; and lastly, most wonderful of all, the internal organisation of the living and moving trichina spiralis—all these details appeared on the screen with a beauty which no ordinary microscope could equal, and were perceptible to spectators in the most distant parts of the room.

It will give additional interest to the bladderworms from veal which were exhibited if I state that they are some of those first reared by Professor Leuckart, of Giessen, and mounted on the slide on which they were exhibited by his own hands. Besides these, I owe several other interesting specimens to the kindness and liberality of Professor Leuckart, and much information to his beautiful collection, in the inspection of which I spent many happy and instructive hours.

The head of the *Taenia grandis* exhibited was presented to me by Mr. F. M. Rimmington of Bradford, together with the beautiful dyed links of the *Taenia solium*, which elicited the special approval of the chairman. Both these preparations are mounted with Mr. Rimmington's glycerine jelly, and are in a state of perfect preservation. I have mounted many specimens with this excellent medium, and can testify that for zoological and medical purposes it surpasses all others in effect and facility of manipulation.

Some of the *Taenia solium* heads were presented to me by Professor E. Wagner of Leipsic, and I take this opportunity of thanking him for his generous gifts.

The splendid specimen of encapsuled trichinæ in human muscle, with the bloodvessel injected by the hands of the late Mr. Quekett (View No. 25), I owe to the kindness of Mr. Norman, preparer of specimens for the microscope. I take this opportunity of stating that I have given to Mr. Norman materials from a number of remarkable cases, illustrating various points in the history of trichiniasis, and that those interested in the subject may obtain them from him.

The fine specimen of echinococous heads was given me by Mr. Nettleship, an assiduous student of medicine of King's College. It was the means of a perfect demonstration.

Thus it will be seen that the co-operation of a great many workers in various parts of the field of science was requisite to secure the objects of natural history which were exhibited this evening. I beg that they all may continue hereafter thus to assist my endeavours, and be sure of my due acknowledgements and reciprocity.

DISCUSSION.

Dr. Cobbold, F.R.S., said he was sure this most important subject could not have had more justice done to it than had been done by Dr. Thudichum on this occasion. If he were disposed to find a slight fault with such a paper as that which they had listened to with so much pleasure, it would be simply this:—he thought the learned author had embraced for one evening's discourse a wider subject than he could possibly do full justice to in all its details; and it was remarkable that he had gone through such a mass of facts in so lucid a manner, condensing them as he had done. He was quite sure that out of Germany no native of that country could have given such a clear exposition of the subject as Dr. Thudichum had done in the English language. Perhaps he (Dr. Cobbold) might speak a little confidently on this subject, having been engaged for the last fifteen years in the investigation of the subject of entozoa in all its phases; he would however confine the few observations he had to offer to the creature last treated of—viz., the trichina. In conjunction with Professor Symonds, of the Veterinary College, and individually as well, he had been working at this subject, and had experimented upon twenty different kinds of animals, fifteen being mammalia and five birds; these twenty animals he had fed with trichinous food. In a great proportion of the mammalia he had succeeded in rearing the trichina, as in the case of the rabbit exhibited this evening, but with none of the birds was he successful in doing so, and his experience in this respect corresponded with that of a number of gentlemen who were appointed by the Board of Trade in one of the States of Germany to conduct experiments on this subject. It seemed that birds could not be infected by the trichina, at least by any ordinary modes of experiment. He might mention that he was one of those individuals to whom Dr. Thudichum referred, having lately made hearty meals upon cattle-plagued ox hearts and sheeps' hearts, and pork cutlets infected with bags of psorosperms, and he had also eaten flesh from almost all the experimented animals in which he did not succeed in rearing the trichina, not being satisfied with microscopic examination alone; and he might add that he had eaten cattle-plague meat with no injurious effects. In the case of actual trichinous infection, however, he would not eat the flesh unless it had been boiled for a very considerable time, for he had boiled flesh — human flesh — full of trichina to ascertain what these creatures would bear, and even after five minutes' boiling he was not able to satisfy himself that they were dead. They coiled themselves up rigidly, it was true, but they had undergone no material change, and he was inclined to think they might still be alive, though he could not absolutely assert that they would have infected him if he had eaten them. He would mention a fact, to show how difficult it was to persuade people that meat was really diseased. Not long since he had had a pig killed which had been fed upon trichinous food. More healthy-looking flesh, to the naked eye, could not be seen, and yet there were 15,000,000 of trichinæ in the carcase of that animal. The people by whom the pig had been slaughtered were strictly cautioned against allowing the flesh to go to a butcher's, for fear of producing an epidemic; but notwithstanding that precaution, they were so satisfied in their own minds that the flesh was wholesome, that they took away the heart and portions of the offal as their perquisite. Most fortunately, however, it was the case that the trichina would not remain in the heart or viscera, and thus no harm was done. He mentioned this fact merely to show how easily diseased meat might get into the market, and unless a proper inspection was made by competent persons like Dr. Thudichum and others, there was great danger of this fearful disease being propagated in this country, and he considered it of the utmost importance that such competent authorities should be appointed.

The Chairman said he now rose to perform the most agreeable, and ordinarily the easiest of his duties, but in calling upon them to return their thanks to the author of the paper just read and discussed, he felt a difficulty, arising from a sense of the imperfection of our human nature, which demands an unusual exertion of the moral sense to stir up a proper feeling of gratitude to the man who had been telling them a number of disagreeable truths. A week or a fortnight of abated zest, not to say dread, of the roast beef, mutton chop, veal cutlet, or boiled leg of pork, might elapse before the impressions faded, and a proper frame of mind was regained, in order to a hearty vote of grateful thanks to Dr. Thudichum for the pains and skill with which he had imparted and illustrated the important mass of knowledge he had laid before the meeting. The evils and hazards he had indicated had long been in existence, and might long continue; but the only power of abating them lay in the knowledge of the causes so clearly and perspicuously laid before the meeting that evening. For any summary of the information and results of this body of doctrine on parasitic disease there now remained little time. In reference to the domestic animal the hog, from which man was liable to derive the worst and most pestilential of his internal parasites, viz., *Trichina spiralis*, we must see that the remedy or defence lay in good wholesome feeding of the animal and thorough cooking of the meat. That the detestable habit of allowing the pig to subsist, until preparation for slaughter, on garbage, would now be known, and ought everywhere to be known to involve, through any refuse of animal matter such garbage might include, the imminent risk of the introduction of trichinal germs into the beast, and the transference of these parasites into the bodies of the pork-eaters, with the consequences which the author of the present paper had so forcibly and truly set before them. Trichiniasis was by no means uncommon where ignorance prevailed, or where the knowledge of the facts was disregarded. But, as he must be brief at this hour, he would limit himself to some higher or wider relations which the history of this disease suggested. Trichiniasis was a rare, if not unique, example of a malady that was really known scientifically to the physician. It was a most instructive, most suggestive instance of what we were striving that medical science should be, and, we might hope, would one day become; it was the instance of a disease of which the cause had been discovered, the nature recognised, the symptoms intelligently understood in reference to the changes of tissue, and the interference with the action of vital parts, occasioning them. In this disease, the relations of the symptoms, histological and physiological, were at length a possession of the physician. He therefore had the power of determining on truly scientific grounds what to do and what to forbear; he knew how far he could go, and in what way, towards the cure or arrest of the malady; and he also knew the limits of his curative means; he could now, on sure grounds, prognose or prophecy respecting it. He left to the countless other ills that flesh was heir to, the symbols of his ignorance of them, exemplified by the vague names "a cold," "indigestion," "typhus," "rheumatism," &c., which terms would have been applied respectively to the several stages of the malady occasioned by the entry of trichinæ into the system, before that wormlet had been discovered. He knew that, like the blight, to which our gardeners referred the various maladies of plants, they were mere signs or masks of the ignorance of the physician as to the real cause of the symptoms before him. The observations of Ruprecht, Wagner, Tüngel, and other acute and philosophic practitioners, as ably summarized by Dr. Thudichum in his valuable and instructive report to the Privy Council,[*] seemed to him (the Chairman) to have a philosophic purpose and bearing, rising beyond their immediate application and benefit. They illustrated the true ways and means by which medicine, as a science, might be advanced. They showed how closely dependent that advance was on the progress of collateral sciences, and especially on those relating to the animal kingdom. The foundation of the exceptionally bright page in the records of medicine represented by trichiniasis, was the result of a purely zoological research, of an application of the microscope to the extension of the bounds of our knowledge of the class *Entozoa*. And this naturally led him to remark that the greatest improvement in the treatment or the mastery of a disease had been more often due to an advance made in a collateral line of knowledge, than to exclusive study of the disease itself. A physician might have devoted his whole time to the small-pox, but would not thus have hit upon vaccination. The wider views of the naturalist Jenner, the favourite pupil of the greater naturalist Hunter, imbued with his master's physiological principles, were the conditions of that blessed gain to mankind. And he was here led to commend these considerations to the attention of legislators in reference to the profit and advantage—taking the lowest view of the matter--that might accrue to the nation by providing the means and instruments indispensable to the due progress of biological science, viz., an adequate national museum of Natural History. The subject had been discussed in that room during the present session, and had been treated by gentlemen holding the honourable position of legislators, in a spirit which showed that the lesson taught by the history of trichiniasis was not wholly uncalled for. In 1866 as in 1862 the main end of a national collection was argued to be to amuse and give elementary instruction to the public. The conditions which 30 years' experience convinced him to be essential to such a collection of natural history as an instrument in the advancement of science, were repudiated together with the aim itself. He read, *e.g.*, in *Hansard*,[†] "Prof. Owen seemed to be the person upon whose sole authority the monstrous outlay of£700,000 was to be justified!" But what if such sum spent on advancing the knowledge of the nature of animals should turn out to be the essential step to a saving of seven millions of money, it might be in one year! The cure or prevention of the rinderpest was less likely to be the result of direct study of the disease than of a collateral ray of light shot from a discovery or step in advance in general physiological science. All analogy taught this. The utmost that the ablest surgeon, *qua* surgeon, could do in the improvement of his art as applied to the treatment of aneurism was done in Hunter's day, by his famous contemporary Pott, of St. Bartholomew's. He gained just reputation by advocating, for the common popliteal tumour, amputation of the thigh, instead of the operation of cutting out the dilated and diseased part of the arterial canal, then in vogue, with frequent fatal result. Hunter, seeking truth in a better way—the way of the wise and prescient legislator, who might assign for the essential instrument in animal physiology the sum even of £700,000, made the required practical discovery, and saved both life and limb. Hunter spent his fortune and much of his valuable time in an extensive museum of comparative anatomy. His investigation of the phenomena of the growth of the antlers of deer, in connection with another branch of natural history, made known to him the singular capacity of arteries to enlarge agreeably with the stimulus of demand, and again to contract permanently when the supply of blood was not needed. He was bold enough with this knowledge to propose to effect the arrest of the flow of blood through the main channel supplying the limb, and he had the gratification of seeing the cure of the aneurism, not mortification of the limb, as contemporaries predicted, prove to be the result of the experiment. The comparatively safe and simple operation of the ligature, or obliteration of the arterial trunk —one of the most brilliant advances of the healing science in reference to the extensive class of aneurismal diseases — was suggested by observations in natural history, as abstract, and as little likely, *à priori*, to lead to such practical result, as the study of microscopic worms or of gigantic whales! "Were they aware," asked an Hon. Member, addressing the House, "that Professor Owen called upon them to build a hall for the reception of whales, of which there were no less than fifteen different species?" To which question a distinguished statesman replied—"Sooner than go to the expense of paying £50,000 when we can get land for £10,000 an acre, I, for my part, am willing, with my hon. friend, to exclude whales altogether from disporting themselves in Kensington-gardens."[*] The inspiration under which it was believed Pope sung:—

> "From Nature's chain, whatever link you strike,
> Tenth or ten-thousandth breaks the chain alike,"

was of a higher mood, and bespoke broader and better views. And we might well suppose that, not even to reduce an estimate or gain a vote, would Queen Anne's Premier have consented to dislodge "one step in the great scale," nor in the exposition "of full creation leave a void." Let them picture the legislator on his bed of unrest, with a painful operation certainly, the loss of life probably, before him, and the latter risk only to be lessened by loss of limb; could it have been revealed to him that a given progress in zoology would one day light the way to an easy cure, recollections of the fling at "the mere enthusiast with his ten-acre scheme,"[†] whereby the scoffer had helped to the rejection of the essential means of advancing natural history would afford him small comfort. The greatest commercial empire in the world, the wealthiest, and one with the widest spread of flourishing colonies, possessed means and advantages over all other countries for the collection and systematic display of the created works. Our continental fellow-workers in science saw the continued lack of such display with regret and wonder. It was to be hoped that another year would not elapse ere England took her befitting course to ennoble herself with that material symbol of advance which a public museum of natural history embodies, and for adequately effecting which, in reference to its highest aims, her resources and command of the world gave her peculiar advantages and facilities. Such were some of the conclusions which he was led to deduce from the bearings and treatment of the subject of that evening's discourse, in reference to increased knowledge and power of dealing with disease in general, and especially of those of the domesticated animals affording the population the bulk of their animal food.

Proceedings of Institutions.

Metropolitan Adult Educational Association.—A conference of delegates from the institutions, working men's clubs, and young men's societies, connected with this Association, was held at the Society of Arts on Thursday evening, the 12th April (by permission of the Council), to take into consideration the arrangements for athletic sports, to be held under the auspices of the Association, at the Crystal Palace, in June. Sir F. R. Sandford presided. Mr. H. H. Sales, the secretary, after having described the origin of the annual *fête* in 1864, and the great success that attended it, and also that of last year, noticed in detail the arrangements hitherto made and the alterations proposed. In the sports, it was suggested that a wider distinction between urban and suburban societies should be made, so as to put competitors on a more equal footing. In consequence of the small number of entries for the band contest, he suggested its discontinuance. At the first *fête*, an open-air concert of 800 voices was given, but the result was so unsatisfactory that it was not renewed. This year an in-door concert on a large scale was proposed. The other details of the *fête*, such as the balloon ascent, entertainments by professional gymnasts (under the direction of Mr. Nelson Lee), distribution of prizes, and other matters, would not need discussion. Captain MacGregor strongly urged the encouragement of those sports that did not require much space, so that members need not go from their institutions to practice. A rowing match, he considered, would not only be attractive but profitable. The delegate of the Duck-lane Club urged most strongly a more equitable competition in the sports, so that the old men might have a chance. He was turned fifty, and could not run a mile race, but he challenged any other man not younger to a three hundred yards' spin, and hoped there would be something this year for men between fifty and ninety. The delegate from Greville-house Institution suggested larger prizes in some events. The delegate from the West London Youths' Institute hoped that silver medals and cups would be substituted for money prizes. Ultimately, on the motion of the delegate from the London Mechanics' Institution, seconded by the delegate from the Stormont-house Club, it was resolved to appoint a sports committee, to consist of a delegate from each institution. At the conclusion of the conference a selection of glees and part-songs were sung by a choir consisting of members of various societies, under the direction of the Rev. G. B. Macilwain. Sir F. R. Sandford thanked the conductor and choir, especially Mr. Heller, who had so carefully trained the greatest number, for their efficient services; and on the motion of the Rev. C. Jacob a cordial vote of thanks was given to the chairman.

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[*] "On the Parasitic Diseases of Quadrupeds used for Food." Appendix No. 7.

[†] Debate on Museum of Natural History, May 19th, 1862, (Hansard), p. 1928.

[*] "Hansard," *ut supra*, p. 1,928.

[†] "Hansard," *ut supra*, p. 1,910.

RAILWAY REFORM.

In Messrs. Travers' Circular, this subject is concluded as follows:—

The transfer of the railways to the Government is defended by the various considerations: (1) That the difference between high charges and low charges has a comparatively small effect on the company's revenue. (2) That the difference could be met by the saving effected in the decreased dividend paid to shareholders after the transfer had taken place, the shareholders of course being compensated by the superior security of Government stock; and (3) That amalgamation, by consolidating the management, would effect a great saving in the working expenses. It remains to notice one or two of the objections which have been made to this momentous project. The most prominent and the most frequently repeated of all is the argument that Government is not fit to manage such an enterprise as the gigantic railway system of the country. We should get, it is said, the execrable principles of red-tape and circumlocution applied to this as to other Government concerns. The Government patronage, too, would receive a huge and most undesirable accession. This objection has been already answered. Government purchase does not necessitate Government *management*, but only Government control. And as for circumlocution, it has not been found that the Post-office has its vitality strangled by these vicious administrative practices. There is plenty of room for improvement in the details of Post-office management; but that private enterprise is not enough to guarantee us all the improvements we need, the railways themselves prove only too satisfactorily.

2nd. There is the general, and in many cases very meaningless cry against centralisation. But surely it is nonsense to talk about encouraging centralisation, when we reflect that the London and North Western Company have in their hands a "territory" some 1,200 miles in extent. Their total capital is between thirty-eight and forty million pounds. Their receipts are between five and six millions per annum. With a company of this extent, commanding the communications of such vast districts, and drawing the revenue of a principality, it is too absurd to begin to apprehend mischief from railway centralisation. Or take the Lancashire and Yorkshire, traversing the busiest and most important region of the country—although its productive mileage is barely four hundred—and drawing a revenue of very nearly two millions. Is not this centralisation to all intents and purposes?

3rd. It is called a monstrous and appalling thing deliberately to add over four hundred millions to the national debt. But there are two sources of national debt. The millions that found their way during the prolonged French wars into the military chests of the continent, and were no more seen, involve us in the most unpalatable kind of debt. We have spent the borrowed money and have nothing to show for it. But if we get four hundred millions into debt in order to get the railways into our hands, it would not be the sheer thankless owing of money. We should have our money's worth to show for it. The state debt would be increased by four hundred millions, but then the state assets would be increased by just the same amount.

4th. It is apprehended that so tremendous an operation as the conversion of all the railway stock into Government stock would afflict the money market with a convulsion which would mean confusion and ruin to thousands of persons. If the change were made in a week, this would be a serious objection. But English financiers are not so clumsy and inexperienced in great operations as to be unable to spread the conversion over a sufficiently wide space of time; indeed, we have already pointed out the way in which the change would probably be conducted.

Against all these considerations, besides the particular answers which it has been attempted to make to them, there must also be set the general position:—First of the shareholders. Can they reasonably expect the legislature to maintain for them their monopoly of the public conveyance as against the plain interests of the community? Are the public to be sacrificed, as they must be if competition is discouraged or prohibited? To borrow the illustration furnished by our correspondents of last week. The Great Western had the monopoly of conveyance between Swansea and London, so they charged 45s. per ton for tea. Another company get access to Swansea, and instantly a reduction of more than 33 per cent. takes place, the rate per ton now being 30s. We have already spoken of coals. If there were unlimited competition, we might have them in London at considerably under 10s. a ton; as it is, we pay sometimes over 30s., and never less for household purposes than 20s. When these facts get fully before the public, it is incredible than any toleration will be afforded to the preposterous assumption on the part of the companies that their monopoly is guaranteed, and that to expose them to competition is to show an unjust disregard of vested rights. The advantage, then, promised to the railway proprietor is that he may realize the full value of his stock now, and though receiving lower interest it will be much higher than he can expect when competition has got the full swing it must have, and besides this he has the best possible security.

Second. The advantages promised to the public are these:—A low and uniform tariff for passengers by ordinary trains—first class, ¾d. per mile; second-class, ½d.; and third-class, ¼d., with rather higher rates for fast trains. A correspondingly low, and, to some extent, a uniform rate for goods. This reduction in railway charges would, it is contended, be equally beneficial to all classes; a reduction to one-third of our present charges would be to all intents and purposes equal to a reduction in taxation of twenty-four millions.

Granting, however, that public opinion may be, for some time to come, unripe for the execution of so unfamiliar an idea, there is one direction in which Government interference is expected, and from which a very considerable benefit may be reaped by the public. If it does not appear expedient for the state to buy the railways, the right of the legislature to revise the tariff is already fully established, and the least result that we can anticipate from the labours of the commission that is now sitting will be a recommendation that this right should be exercised. It may be difficult or impossible to carry reduction and a greater uniformity of charge to so full an extent as if the state were the proprietor of the railways. But that these important reforms will in some measure be carried out is quite certain. Two-and-twenty years ago a tremendous cry was raised by the railway interest, when the companies were forced to run certain trains in which they were only to charge third-class passengers a penny a mile. The same sort of cry will no doubt be raised again. But it is to be hoped that the guardians of the public interests will remain firm to the great principle solidly established in 1844 by the legislative institution of compulsory "parliamentary" trains. That Government has no right to interfere with the working of private undertakings was the cry then, as it will be again. Let us borrow from the *Times* of 1842 a description of the sort of evil which the public had to endure, and which the companies claimed their right to perpetuate if they chose. "A third-class passenger leaves Paddington in an open carriage, no difference being made to counteract wind or weather, at half-past four a.m. When he arrives at Swindon he is detained upwards of an hour, and at length gets to Bristol, if the train keeps its time, in nine and a half hours, while the first and second-class carriages make the same journey in less than half the time. If a third-class passengers wishes to go on to Taunton from any place east of Bristol, he is detained from four to five hours in Bristol, and is kept on the road, at a moderate calculation, from fourteen to sixteen hours; whereas, on the other hand, first and second-class passengers arrive at the same destination in six and a half hours." Perhaps in the year 1888, when our descendants read of the enormous fares that we pay now, of their inconsistency on different lines, of their inconsistency in the case of goods of very much the same kind, of their gross disproportion to the cost, they will wonder how such a state of things was endured for a day, just as we wonder how even the smallest attention was paid to the remonstrances of railway directors when they were compelled to desist from such treatment of passengers as that we have just described. If the state cannot purchase the railways with advantage, at least it may fix the fares and freightages, just as it fixed the fare of a certain kind of train two-and-twenty years since. The principle was admitted then. There can be no reason why its application should not be extended now.

Fine Arts.

Art Galleries in Paris.—As the opening of the annual exhibition on the first of May attracts many artists and amateurs to Paris, it will be useful to mention that some important changes have taken place with respect to the works of living artists, the property of the public. The Luxembourg Gallery has been completely re-arranged, and a new department constituted for the works of artists recently deceased; here they will remain for five years after the death of the author, when they will be removed, in accordance with former practice, to the Louvre. The worst-lighted gallery, namely, that which contained works by foreign artists, has been closed, and the pictures transferred to the gallery of the late Duc de Morny, in the Palace of the President of the Corps Législatif. Amongst these are pictures by Achenbach, Heilbuth, Ch. Gleyre, Louis Knaus, Palizzi, H. Scheffer, Hamman, and Schreyer. These not being sufficient to fill the gallery, a certain number of French works have been added, including, amongst others,—"Joan of Arc," by Ingres; "Haymaking," by Rosa Bonheur; "Bullocks Going to Labour," by Troyon; "A Coast Scene," by Isabey; "A Woodland Scene," by Th. Rousseau; "Arabs," by Fromentin; and a "Scene of the Saint Bartholomew," by Robert Fleury.

Water-Colour Exhibition at Brussels.—The Exhibition of the Belgian Society of Water-colour Painters opened on the second of April. This is the eighth exhibition of the Society, and is reported to be far above the average. The number of works exhibited is nearly two hundred, and a great many have already been purchased either for the lottery established by the Society, or by private individuals. Art in all its phases seems to be flourishing in Belgium, perhaps more than in any other country in Europe as regards the higher qualities.

Manufactures.

Russian Worsteds and Woollens.—The manufacture of napless or plain woollen stuff goods has not made the same progress in Russia as the production of cloth. The mechanical spinning of long-staple or combing wool, which met with so many difficulties in other countries, was first practically undertaken in Russia about the year 1845, by the brothers Gutchkoff. Following in the steps of foreign manufacturers, they began by combed or spinning wool, making use of Russian raw material. The yarn thus produced proved well adapted to cheap mixed worsteds, as well as to printed fabrics of pure wool, of middling quality, such, for instance, as mousseline-de-laine, the inequality and want of smoothness of the yarn being almost entirely concealed by the colours. In 1850, five more mills were opened in Moscow for the spinning of combed wool. These principally use the best qualities of Russian wool. The machinery employed by the brothers Gutchkoff is chiefly of French origin, the apparatus of Heilman Schlumberg being preferred. Flint and Donisthorpe's machinery is used at Count Lamsdorf's manufactory at St. Petersburg. The weaving of smooth worsted fabrics preceded the introduction of machine weaving of long-staple wool, especially as regards printed woollens, but it has, nevertheless, not made the same progress as the manufacture of cloth, silk, and cotton. The want of this necessary material has not been so great an impediment as the influence of fashion, which requires the constant production of new designs. These fabrics, being also principally consumed by the wealthier class, have a comparatively restricted market. The consumption of mixed woollen goods is, however, on the increase in Russia, and will, no doubt, greatly promote the spinning and weaving of long-staple Russian wool. Technically speaking, the weaving of long-staple wool is making rapid progress in Russia, although still in the hands of but few manufacturers. Jacquard and other improved looms are being widely introduced, and the art of dyeing is now more carefully studied.

Colonies.

Queensland—Revenue and Imports.—A comparative statement of the consolidated revenue of this colony paid into the treasury during the years ended Dec. 31st., 1864, and Dec. 31st., 1865, shows considerable progress.

The figures aare as follows: 1864, £502,456; 1865, £631,431. During the year 1864 the declared value of the imports at Brisbane amounted to £1,677,547; and the declared value of the same for the year 1865 exceeds the previous year by £293,607.

Pastoral Pursuits in Carpentaria.—In the year 1861 the stock was estimated—cattle, 29,236; sheep, 402,358; horses, 2,161. The settlers have taken up 4,973 miles, and as the lowest amount of stock required to hold the country so acquired would amount to not less than 125,000 sheep, it will not be extravagant to estimate an increase of 50 per cent. on the numbers computed in 1864 as representing the amount of stock in Jan. 1866 existing in Northern Queensland.

Paraffine.—New South Wales.—A Sydney paper says that the works of the Hartley Kerosene Oil and Paraffine Company are progressing rapidly. The company erected an experimental plant in Sydney, and have been recently engaged in making experiments on the extraction of the crude oil, and in the refining it so as to produce a good article. The substance to be operated on differs greatly from the Boghead coal, and therefore requires its own peculiar treatment; but the results of these experiments are said to be that the company can now produce an oil of any specific gravity required for burning free from colour and with scarcely any smell. The remaining heavy oils produce an excellent article used for lubricating machinery, and from them is extracted paraffine. The company had about 300 tons of coal raised and on the ground. The quantity of oil procured from a ton of coal is 160 gallons; the quantity of gas is 18,000 feet per ton.

Obituary.

Professor William Dick, Veterinary Surgeon to the Queen, and Professor of Veterinary Medicine at the Veterinary College, Edinburgh, died on the 4th April, in the 73rd year of his age. In Professor Dick the veterinary profession of Great Britain has perhaps lost its most distinguished representative, and Scotland the man to whom it owes the honourable position it has so long maintained in veterinary practice, and especially in veterinary education. The Edinburgh Veterinary College was founded by him, alone and unaided, in 1818; it was patronised by the Highland and Agricultural Society of Scotland in 1823, and established by Royal charter in 1842. During that long period, the college, as an educational institution, and Professor Dick in his relations to it, as well as in his general practice, have commanded the confidence and ready co-operation alike of the scientific and the practical men, of the proprietors and the tenant farmers of Scotland. Professor Dick was readily acknowledged by the most accomplished medical professors of our University to have a position as scientific as their own, while the practical mind of the agriculturists of Scotland recognised in him one in whom they at once learned to respect the veterinary art. The treatise on this subject which appeared in the *Encyclopædia Britannica*, and was afterwards published separately, is the only formal treatise which he has left behind him. He was secretary to the Royal Physical Society of Edinburgh for many years, and at the outbreak of the cattle plague he was appointed Government Inspector of Foreign Cattle for the county of Mid-Lothian.

Notes.

Rochelle Exhibition.—An exhibition embracing the Fine Arts, Industry, and Horticulture, is announced to take place at La Rochelle in May at the same time as the annual Agricultural and horse exhibition occurs. The Fine Art exhibition will include not only the works of living artists, but also pictures and other objects of art of all classes belonging to collectors. The exhibitions are announced to open on the 21st May, and the Fine Art and industrial portions will remain open for one month.

MEETINGS FOR THE ENSUING WEEK.

Mon......Geographical, 8½.
Antiquaries, 2. Annual meeting.
Tues ...Medical and Chirurgical. 8½.
Civil Engineers, 8. 1. Mr. T. A. Rochussen, "On the Performance, Wear, and Cost of Maintenance of Rolling Stock." 2. Mr. Robert Manning, "On the Results of a Series of Observations on the Flow of Water off the Ground in the Woodburne district, Ireland."
Zoological, 8½.
Ethnological, 8. 1. Mr. John Thrupp, "On the British Superstitions relating to the Hare, the Goose, and the Fowl." 2. Mr. Thomas Wright, "On the Intercourse of the Romans with Ireland."
Royal Inst., 3. The Rev. C. Kingsley, "On Science and Superstition."
Wed. ...Society of Arts, 8. Mr. Jabez Hogg, "On the Perils of Mining, and the Means for Preventing them."
London Inst., 12. Annual meeting.
R. Society of Literature, 4. Annual meeting.
Archæological Assoc., 8½.
Geological, 8. 1. Sir Philip de M. G. Egerton, Bart., M.P., "On a new species of *Acanthodes* from the Coal-shales of Longton." 2. Mr. Harry Seeley, "On the Gravels and Drift of the Fenland." 3. Mr. Alfred Tylor, "Remarks upon the interval of time between the formation of the Upper and Lower Valley-gravels."
Thur. ...Royal, 8½.
Royal Society Club, 6.
Royal Inst., 3. The Rev. C. Kingsley, "On Science and Superstition."
Fri ......Society of Arts, 8. Cantor Lecture. Dr. Crace Calvert, F.R.S., "On the Transformation of Organic Acids and Animal Substances." (Lecture III.)
Royal Inst., 8. The Very Reverend the Dean of Westminster, "On Westminster Abbey."
Sat ......R. Botanic, 3¾.
Royal Inst., 3. Mr. George Scharf, "On National Portraits."

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Par. Numb.

Delivered on 24th March, 1866.

85. Bills—Lunacy Acts (Scotland) Amendment.
86. ,, Cattle, &c., Contagious Diseases.
88. ,, Poor Persons Burial (Ireland).
130. Railway and Dock Bills—Return.
131. Population, Houses, &c.—Return.

Session 1865.

461. Commons and Open Spaces—Return.

Delivered on 26th March, 1866.

41. Bill—Petit Juries (Ireland).
15. (306 to 312) Railway and Canal, &c., Bills—Board of Trade Reports.
113. Public Accounts—Special Report on the Exchequer and Audit Departments Bill.

Delivered on 27th March, 1866.

114. Election Petitions—Return.
122. National Gallery—Return.
126. Tame Valley Viaduct—Return.
132. Dublin Metropolitan Police—Account.

Delivered on 28th March, 1866.

128. Harbour Loans—Return.
134. Navy—Return.
151. Civil Services—Statement of Excesses on Grants of 1864-65.

Delivered on 31st March, 1866.

89. Bill—Grand Juries Presentment (Ireland).
117. Parish Ministers (Scotland)—Return.
135. Accidents (Metropolis)—Return.
68. (II.) Trade and Navigation Accounts (28th February, 1866).

Delivered on 5th April, 1866.

79. Bengal Sanitary Commission.
104. Metropolitan Police—Accounts.
105. Bank Notes—Return.
141. Ships *Octavia*, *Constance*, and *Arethusa*—Return.
152. Civil Services—Abstract showing Grants proposed for 1866-7; sums voted on account; and sums required to complete.

Delivered on 6th April, 1866.

15. (313 to 326) Railway and Canal, &c., Bills—Board of Trade Reports.
124. Army—Account of Receipt and Expenditure.

Delivered on 7th April, 1866.

81. Bills—Railways (Guards and Passengers Communication).
90. ,, Cattle Assurance.

15. (327 and 328) Railway and Canal, &c., Bills—Board of Trade Reports.
147. Stephens, James—Report of the Inspectors General of Prisons.
149. Army (Hong Kong and Kowloon)—Report.

Session 1865.

442. (A. ix.) Poor Rates and Pauperism—Return (A).

Delivered on 9th April, 1866.

84. Bill—Commons (Metropolis).
Public General Acts, cap. 7 to 13.

Delivered on 10th April, 1866.

136. Doe Park and Bradford Reservoirs—Further Correspondence.
139. Totnes Election—Minutes of Evidence.
109. Navy (Masters)—Return.
148. Army (Officers and Men Drowned, &c.)—Returns.
University Education (Ireland)—Letter.

Delivered on 11th April, 1866.

76. Bills—Common Law Procedure Amendment Acts (Ireland).
96. ,, Cattle, &c., Contagious Diseases (Amended).
112. East India (Mysore)—Correspondence.
155. New Courts of Justice and Offices—Estimate.

Delivered on 12th April, 1866.

92. Bills—Local Officers Superannuation (Ireland).
100. ,, Art.
168. Borough Electoral Statistics—Return.
169. Voters—Return.
170. Electoral Statistics—Return.
150. *London* Steam Ship—Evidence.

Delivered on 13th April, 1866.

99. Bill—Marriages (Ireland).
138. Committees—Returns.
142. Courts of Probate—Accounts.
166. Portpatrick and Donaghadee Harbours, &c.—Correspondence.
140. Great Yarmouth Election Petition—Minutes of Evidence.
Cattle Plague (Ireland)—Sequel to the Report of the Committee.

Delivered on 14th April, 1866.

153. Colonial and Foreign Possessions—Return.
161. Edinburgh Parliamentary Burgh—Return.
164. Peerage of Ireland—Returns.
165. Exchequer Bills—Return.
167. Immigrants and Liberated Africans—Return.
171. Dublin Port—Return.
173. Metropolitan Board of Works—Return.
Manufactures, Commerce, &c.—Reports by Her Majesty's Secretaries of Embassy and Legation.
Victoria, Australia—Further Correspondence.
Pollution of Rivers—First Report of Commissioners.

Delivered on 16th April, 1866.

91. Bills—Customs Duties (Isle of Man).
97. ,, Finsbury Estate.
98. ,, Crown Lands.
102. ,, Divorce and Matrimonial Causes.
15. (329) Railway and Canal, &c., Bills—Board of Trade Report.
63. (v.) Committee of Selection—Sixth Report.
115. Isle of Man (Financial Measures)—Correspondence.
158. Burghs (Scotland)—Return.
159. Cattle Plague—Return.
162. Municipal Boroughs, &c.—Return.
163. Humber River—Correspondence.
172. Tidal Lands and Epping Forest—Correspondence.
185. Cattle Importation (Netherlands)—Order in Council.

Patents.

From Commissioners of Patents' Journal, April 13th.

Grants of Provisional Protection.

Bricks—3125—P. Bawden.
Cast steel, transforming scraps of steel and iron into ingots of—859—C. E. Frooman.
Central fire breech-loading cartridges—880—W. T. Eley.
Cleaning—837—C. Kozière.
Coffer dams—816—H. King.
Cooking apparatus—895—F. P. Warren.
Cricket and other balls—739—C. Huntley.
Croquet balls—884—W. Moseley.
Envelopes—848—H. Rankin.
Factories, &c., travellers for—411—W. N. Wynn.
Fibrous substances, treating—265—H. Sherwood.
Fire-arms, breech-loading—850—J. H. Burton.
Fire-arms, breech-loading, and cartridges for same—864—T. Wilson.
Fire-arms, gun cloth charges for—845—W. A. Dixon.
Furnaces—731—C. J. Richardson.
Goggles—890—S. H. Salom.
Gravitating level—749—A. V. Newton.
Guns, cartridges for breech-loading—868—J. Erskine.
Heat, generating—738—M. P. W. Boulton.
Hoisting apparatus—874—A. V. Newton.
Horse shoes—902—J. Gamgee.
Hot water pipes—429—G. W. Cumming and J. K. Edmonds.
Metallic stuffing box—715—V. Duterne.
Musical sounds, augmenting—852—J. Macintosh.
Music, turning over the leaves of—900—W. Dixon.
Oils, distilling—896—W. A. Lyttle.
Power hammer—872—A. V. Newton.
Printing machines—481—A. Applegath.
Railway carriages, propelling—851—H. E. Newton.
Railway engines and carriages, springs for—860—S. Moulton.
Ropes—854—R. Petty.
Safes—895—J. Bracher.
Salt—3105—D. Hall.
Screw gill boxes or hackle frames—866—B. Berry, jun., & G. Bromley.
Ships and vessels, reefing and furling sails of—876—J. Medhurst.
Spinning, self-acting mules for—831—L. R. Bodmer.
Steam boilers, generating steam in—878—R. Newton.
Steam turbines—891—C. Wenner.
Substances, softening—691—J. Patterson.
Substances used in purifying gas, treating—862—W. E. Newton.
Waste liquors, treating—863—C. E. Amos and W. Anderson.
Weaving, looms for—846—C. D. Abel.
Window fittings—857—M. Archdeacon.
Woven fabrics, drying and stentering—844—J. McNab.
Zinc—671—C. W. Siemens.

Invention with Complete Specification Filed.

Ladies' skirts, hoops of—1015—S. J. Sherman.

Patents Sealed.

2664. J. Orrin and T. Geer.
2667. J. L. Hancock.
2668. J. L. Hancock.
2669. H. Skinner.
2688. T. Jones and E. K. Mason.
2689. C. H. Cope.
2703. A. L. McGavin.
2711. W. B. Haigh & W. Bissell.
2716. M. L. J. Lavater and J. Kershaw.
2904. A. V. Newton.
3278. E. A. Dana.
132. A. F. Johnson.

From Commissioners of Patents' Journal, April 17th.

Patents Sealed.

2695. J. Penton.
2697. G. R. Ghiselin.
2698. T. Routledge, D. Bentley, and J. B. Jackson.
2709. J. and G. H. Needham.
2710. R. Fell and D. Hammond.
2713. W. Sumner.
2714. T. Cooke.
2719. I. Baggs.
2721. W. H. Kitchen.
2724. J. D. Frazer.
2725. J. H. Dickson.
2728. I. Roberts.
2731. W. Parsons.
2732. S. P. Matthews.
2738. A. Chaplin.
2741. W. Clark.
2745. H. Bateman & E. G. Garrard.
2747. D. G. and S. Staight and J. Cheverton.
2749. W. Clark.
2751. G. L. Scott.
2752. W. M. Scott.
2782. J. Buckingham.
2790. F. Tolhausen.
2844. H. J. Sanders.
2882. G. A. Ermen.
2891. W. E. Newton.
2894. E. T. Hughes.
2924. H. E. Newton.
2933. W. Clark.
3023. W. E. Newton.
3182. J. Warburton.
5. T. Prideaux.
16. A. and W. Young.
33. W. H. Towers.
40. E. Taylor.
486. A. V. Newton.

Patents on which the Stamp Duty of £50 has been Paid.

930. R. Newton.
1025. W. A. Shaw.
1291. A. W. Hofmann.
937. J. Combe & J. H. Smalpage.
950. H. Eaton.
974. T. A. Weston.
1086. M. Henry.
947. H. A. Bonneville.
948. A. Marriott.
967. R. C. Clapham.

Patents on which the Stamp Duty of £100 has been paid.

921. R. A. Brooman.
1092. T. H. Arrowsmith.
933. J. Hughes, W. Williams, and G. Leyshon.
938. J. Beattie.
972. J. Seaman.
996. H. Rawson.
935. J. Luis.
957. W. E. Newton.
961. J. Sidebottom.
1008. E. Clark.
949. G. Ashcroft.

Registered Designs.

Triple Roller, Double-Action, and Self-Adjusting Mangle—April 9—4782—Messrs. Ross and Windows, High-road, Tottenham.
Portable and Adjustable Wind and Sun Rifle Screen—April 10—4783—Captain R. Leeson, Fitzwilliam-street, Cambridge.
Improved Bar for Feeding Racks for Sheep—April 11—4784—W. Brenton, Cornwall.
Fastening for the Lids or Covers of Box Irons and Charcoal Irons—April 11—4785—E. Siddaway, West Bromwich.
A Box Iron—April 14—4786—W. Cross, West Bromwich.
Part of a Portable, Folding, Spring or other Mattress—April 16—4787—G. T. Horrell, South-street, Finsbury.
Fan Box or Casing—April 18—4788—Powis, James, and Company, Victoria-works, Belvedere-road, Lambeth.